SHUTTLE ZX HELI REVIEW

April 1991

MODEL AIRPLANE NEWS

THE WORLD'S PREMIER R/C MODELING MAGAZINE

48120

Goldberg ULTIMATE BIPE

Construction: WILD THING

Rohacell Foam Beats Balsa?!

SCHNEIDER CUP SUPER SHOOTOUT!

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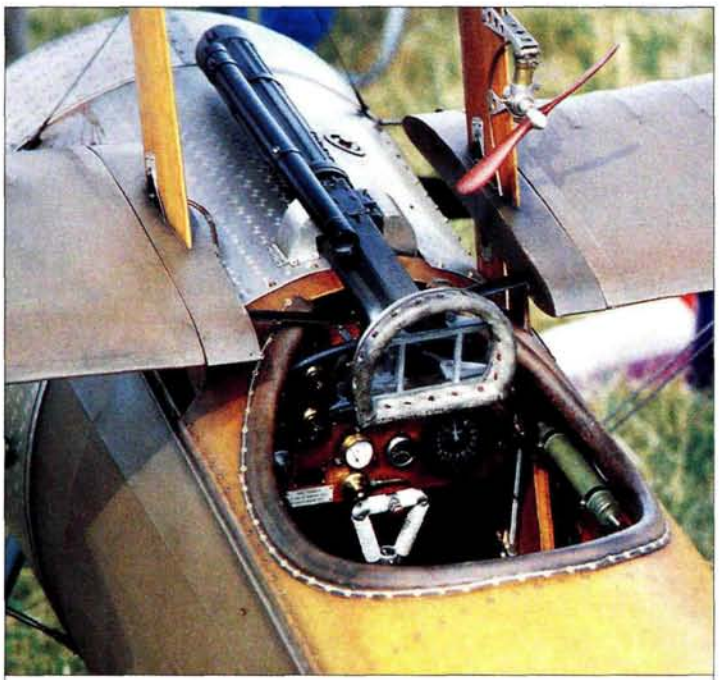
APRIL 1991 VOLUME 119, NUMBER 4

MODEL AIRPLANE NEWS



ON THE COVER: *at the 2nd Annual Schneider Cup Re-enactment, Cliff Adams' Supermarine (upper left) roars toward pylon 1 with Lake Havasu City in the background; a 1929 Savoia Marchetti S.65 by John Sullivan and Mike Johnson (lower right) awaits action (see page 28). Tom Stryker's Wild Thing construction design (upper right, see page 44) targets fun-fly hot-doggers; David Hudson's F-117A Stealth "fighter" makes an appearance at Southwest Fan Fly (see page 52).*

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EDITORIAL

by TOM ATWOOD

Col. Bob Thacker's Ryan X-13 Vertijet. (See our coverage of the 8th Annual SW Fan Fly on page 52.)

As we go to press, the Tomahawk and Patriot have proven themselves under fire. We at Air Age offer our full support to our soldiers in the Middle East, and we hope for the earliest successful conclusion. Since many in our armed forces are R/C enthusiasts, we're sending them more than 10,000 Air Age R/C magazines.

This issue, we begin our Second Great R/C Design Contest (see our ad in this issue for particulars, including cash prizes). Our last contest, kicked off in the spring of 1987, generated an overwhelming response—approximately 400 entries in just under three months. This year, we're allowing even more time so that the visionaries among you—with gleams in your eyes—will have enough time (if you hustle!) to bring a new R/C craft into the world from scratch. We will publish construction articles on the top five winners (who, to qualify, must provide good black-and-white construction photos and full-size drawings from which we can create inked plans).

We'll consider all designs, whether scale, sport, or experimental, and whether motivated by electric, ducted fan, glow, diesel, steam, CO_2 or other power! At least one of the winning entries will be an unconventional design. We'd like to see an advanced electric in the winners' circle as well, but it's not just up to the *MAN* editors. You, our readers, will help choose the winners from a selection of top contenders.

Looking for some basic design tips? Three works that might be of assistance are: *Model Aircraft Aerodynamics*, by Martin Simons, 1987, Argus Books Ltd.; *R/C Model Airplane Design*, by A.G. "Andy" Lennon, 1986, Motorbooks International; and *Airfoils at Low Speeds* (Soartech 8), by Selig, Donovan and Fraser, 1989, (a comparative study of model airfoils, published by H.A Stokely, 1504 N. Horseshoe Cir., Virginia Beach, VA 23451). Good luck!

By the way, Air Age is interested in purchasing a complete set of *Model Airplane News* (or intact major portions). If you can help, please call or write.

MODEL AIRPLANE NEWS

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AIRWAVES

WHERE TO WRITE TO US
If you're writing to the editors (and we'd love to hear from you), please be sure to address your letters to "Airwaves," *Model Airplane News*, 251 Danbury Road, Wilton, CT 06897. Only subscription orders and inquiries are handled by our Customer Service Department in Mount Morris, IL; other mail addressed there must be forwarded to Connecticut, and this leads to long delays.

ERRATA

In the "Ace Seamaster 120" review (February '91), Coverite Permagloss, a pre-painted fabric, was incorrectly cited as a "fiberglass" fabric owing to an editorial error. Also, the engine shown in the construction pictures was an OPS Maxi 30. The color pictures were taken by J.C. Onorato.

In the "Ultimate Biplane" construction article (December '90) and the "Hot Wings" article (March '91), we erroneously cited Perry Aeromotive, Inc. as the source for Perry pumps. Perry Pumps are now sold by Varsane Products, 546 S. Pacific St., Ste. C-101, San Marcos, CA 92069; (619) 591-4228. Have you made this correction in your address book?

R/C R&R AT DESERT SHIELD

It wasn't long ago that we received word of the crisis in Saudi Arabia. Many of us packed our mobility bags, checked our gear and looked at our spouses and children and wondered if we'd grow old with them. When Rick Turville, one of our R/C buddies, wrote [from Desert Shield] saying that he was bored, we decided to come to his rescue! Jim Prouty (founder of our club) suggested that we build and send him an electric glider.

It was amazing to see such team effort. The glider came together in one night, but not without some difficulties (we had to find a radio, batteries, MonoKote, adhesives, etc.). There were so many people at the building party that there

wasn't room for everyone around the 7-foot building table. Each person worked on a different part until it was finished. One of the most impressive things about the evening was the participation of the local Japanese, who reminded us that friendship extends further than just the flying field. The project was finished in 6 hours, and the last person left the workshop at about 2 a.m. (The photo shows Jim Prouty presenting the glider to Debbie Turville.)

I invite others to join this venture. If you know a modeler who's involved in Desert [Storm], send me his name and address. If one of your club members is there, why not build and send him an electric? I also invite manufacturers to send donations to the address below so that if someone needs an item, we can provide it. (If we don't use it, we'll return it.) We're committed! What about you?

TSGT. KELVIN ESPADA
(Okinawa)
PSC 2, BOX 15585
APO SF 96367

Kelvin, we admire your actions and think your letter will strike a responsive chord. We've been sending R/C magazines to the troops in Desert Storm. Given the increased military activity since we received your letter, however, non-essential items (e.g., model planes and magazines) have a lower transport priority. Donors are advised to contact Kelvin and confirm arrangements before shipping R/C equipment or supplies. TA

AMA ABOUT FACES

During a telephone conference on December 17, 1990, the Academy of Model Aeronautics' (AMA) Executive Council overwhelmingly voted to reinstate member-to-member liability coverage in the insurance protection extended to members. The Council also increased the deductible amount for property damage to $250 per claim and set the medical expense reimbursement at $25,000. The raised deductible and the new medical coverage amount are necessary to balance the risk the AMA assumes by reinstating the member-to-member liability coverage. Member-to-family member benefits will be excluded from the coverage.

These are significant amendments to a Council directive passed in July '90 that eliminated member-to-member and member-to-family member liability benefits and increased the medical coverage from $7,500 to $100,000. Those revisions were made to combat the soaring litigation expenses associated with

(Continued on page 10)

AIRWAVES

member-to-member liability claims. AMA Executive Director Vince Mankowski said the earlier directive was amended in response to the numerous requests of the membership and the needs of the chartered clubs. "The negative feedback received at headquarters after the exclusion of member-to-member liability protection was announced was astounding. The reinstatement of the member-to-member liability benefits was made to amicably resolve the controversy surrounding the 1991 insurance coverage," Mankowski said. He added, "AMA will restructure the insurance program to allow the member-to-member liability coverage to continue. This will impact future dues rates, which is something the AMA had tried to avoid in this matter."

AMA Press Release

Thus, with this press release, we've come full circle and, fortunately, the AMA has rescinded the lion's portion of its recent decision to cut back on liability coverage. In response to our invitation for readers' comments, we've received many letters. Here are some representative excerpts:

In the Feb. 1991 "Airwaves," you asked for comments on the AMA insurance crisis. It is a crisis, because if the AMA doesn't correct its mistake very quickly, there are a lot of people just waiting for the opportunity to overthrow the AMA and its bureaucracy with a new organization that they feel is more responsive to the membership's needs and desires. I think that while a new organization might possibly be able to provide adequate insurance and a means of communication, and be able to "make it," the AMA certainly wouldn't cease to operate. We'd end up with two (or more) organizations, each one weaker than the original. We have to solve the problems in the otherwise successful organization that we now have.

I'm enclosing an editorial slated for "SAM Speaks," the official publication of the Society of Antique Modelers [excerpts follow]: "AMA...you simply have to...reduce unnecessary costs in other areas (i.e., travel and administration); eliminate some of the major unnecessary programs and undertakings; and get back to providing the real basics (i.e., an adequate insurance program at reasonable cost)."

ROBERT L. ANGEL
Western Vice President, Society of Antique Modelers
Santa Maria, CA

...I don't think more than one or two of all the people I fly with will stay in the AMA without insurance. There are thousands of members who won't pay for membership without it, and thousands who will never join. None of the people I've recruited for the AMA joined until I told them about the insurance.

C.L. BUCKMASTER
Weatherford, TX

...One of the AMA's best selling points has been its insurance program...What about reduced liability limits?...dues increases? I, and many of my fellow AMA members, suspect the AMA is taking this action to divert more of our dues to the national flying site in Muncie, IN...The way in which the AMA came to its decision and implemented the change is infuriating...No effort was made to solicit input from its customers, the members...How much will the annual dues be reduced due to lower insurance expenses? Why weren't those dues reduced for 1991?

ALLAN QUIAT
Houston, TX

...I've asked fellow members why

they joined the AMA, and in nine out of 10 cases, the insurance coverage was the main reason...No one mentioned that the AMA does a considerable amount of work to secure radio frequencies and many other functions that enhance the position of modelers and the industry...I also question the amount of input the general membership had regarding the new [changed] insurance coverage. Sometimes, the hierarchy fails to understand that an organization exists because of its membership, and it can only continue to exist if its members remain loyal.

LOUIS D. LOPEZ
Inverness, FL

We haven't received any letters commending the AMA on the insurance changes. TA

.049 FAN-JET UNITS?

I'm hopelessly devoted to your magazine, and I read it cover-to-cover. I'm currently building the .049 Fantrainer from *MAN* plans, and also the Electric Hots. Can you tell me if anyone sells an .049 ducted-fan unit (besides Midwest's RK-049)?

WILLIAM CHAPMAN
Puyallup, WA

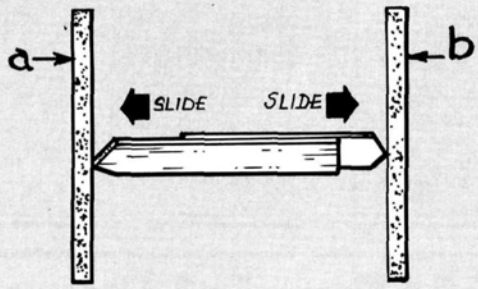
William, the RK-049 (which is no longer produced by Kress Jets, but is still on some dealers' shelves) is the only .049-size commercial fan unit that we know of. Kress Jets sells a new RK-709 unit for Tee-Dee .09s, Enya 11CXs, O.S. .10s, Irvine .15s, CS .09s and other similar-size engines. With the introduction of the new Shuriken .049 engines

(Continued on page 107)

HINTS & KINKS

Model Airplane News will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman, c/o Model Airplane News, 251 Danbury Rd., Wilton, CT 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we cannot acknowledge each one, nor can we return unused material.

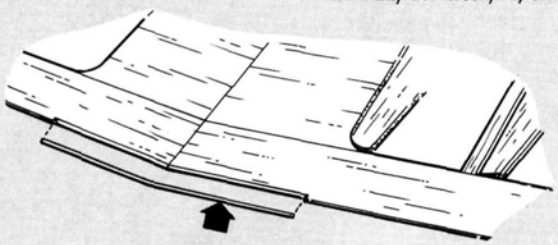
by JIM NEWMAN



MEASURING INSIDE

If you need to determine a fuselage's inside width for, say, servo rails, and you don't have a suitable caliper, try this. Hold two short sticks together (as shown). Slide the sticks apart until they touch the inside of the fuselage ("a" and "b"), then, still holding them together, remove them and measure their combined lengths. (You could reach inside and clip the sticks together with a clothespin, which would be more effective than applying a drop of CA.)

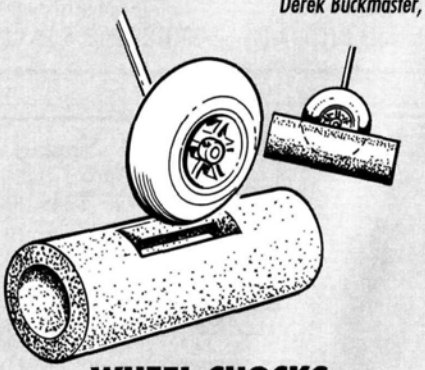
Will Enns, Clearbrook, BC, Canada



TRAILING-EDGE REINFORCEMENT

When you hold the wings on your model with rubber bands, there's a chance that the bands will cut into the balsa trailing edge. Reinforce the edge by gluing a short length of music wire to it with CA or epoxy ($1/16$-inch wire seems to work on most models). If you recess the wire as shown here, it will be practically invisible under the covering.

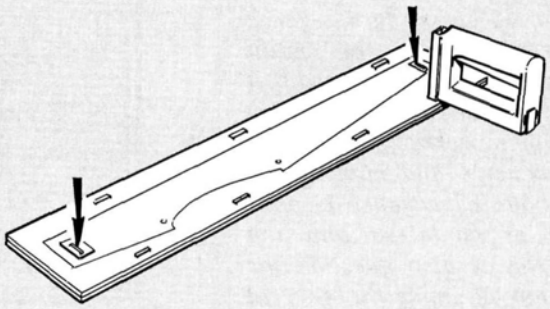
Derek Buckmaster, Pittsfield, MA



WHEEL CHOCKS

Make these simple wheel chocks out of foam pipe insulation. Slip them onto the wheels of your model to prevent it from rolling during your trips to the field. "Nose" the model up against something immovable, and if you *have* to hit the brakes, it won't continue to move at 55mph until it's stopped by something solid!

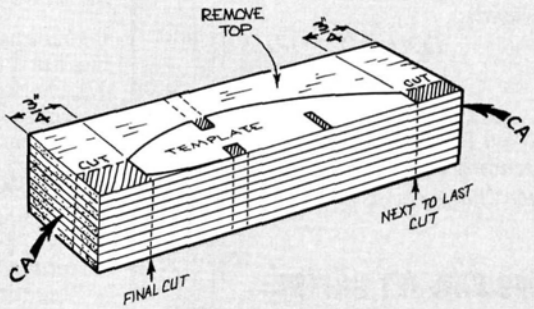
John Schifko, St. Louis, MO



CUTTING IDENTICAL PARTS

If you want to make identical parts, secure the blanks with staples before you start cutting. Two staples—one at each end—with a small square of cardboard under each to protect the wood, will hold the blanks securely while you cut out the parts and final-sand their edges.

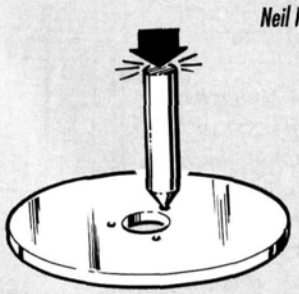
Tom Fuller, Kalamazoo, MI



ALIGN RIB BLANKS

Keep rib blanks under control in this way. Use pieces of wood that are long enough to allow $3/4$ inch at each end of the rib template, and glue the ends of the pieces together with CA, used sparingly. Next, sand the side of the stack (the bottom of the ribs) flat before you glue the template into place with rubber cement. Now, saw and sand the top camber, cut the spar notches, and push short lengths of the spar material into them to stabilize and strengthen the stack of ribs. Finally, cut off the glued ends of the wood. This method uses a little more wood, but it sure beats using a lot of pins or nails!

Neil Reid, San Francisco, CA

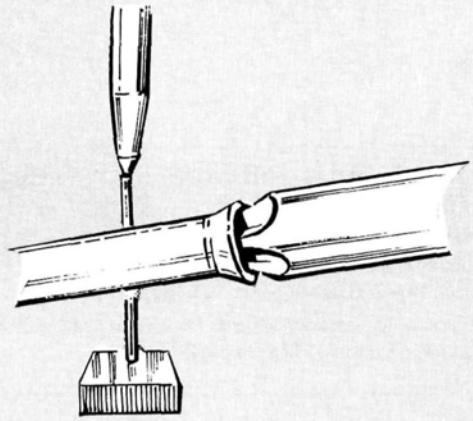


TIGHTEN A BACKPLATE

To tighten a metal spinner backplate that fits the shaft too loosely, use a center punch to make a few punch marks around the shaft hole. This usually pushes the metal inward enough to take up a few thousandths of an inch of clearance.

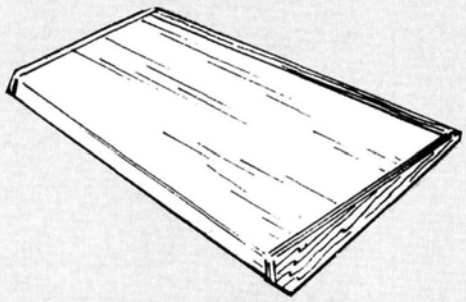
E.E. Wolfe, Scottsdale, AZ

HINTS & KINKS



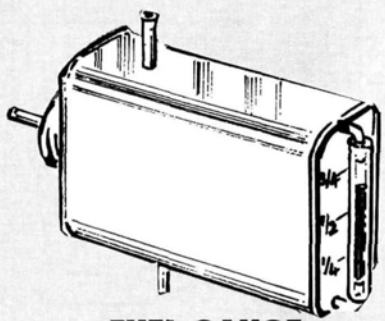
SLIPPING LINES

To prevent fuel lines, clunk lines, or retract lines from slipping off the brass tubes, flare the ends of the tubes by forcing a Phillips screwdriver into them. Alternatively, you could stand the tube on a metal block and gently tap a center punch into its ends. Smooth the sharp edges.



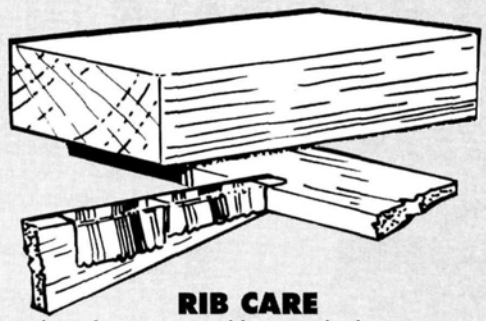
WARPED CONTROL SURFACES

Eliminate warps on solid-balsa control surfaces by attaching end ribs of thin, 1/32- or 1/16-inch-thick ply. It's also worthwhile to glue a narrow strip of spruce to a trailing edge before you shape it, because spruce is more resistant to dings than balsa.



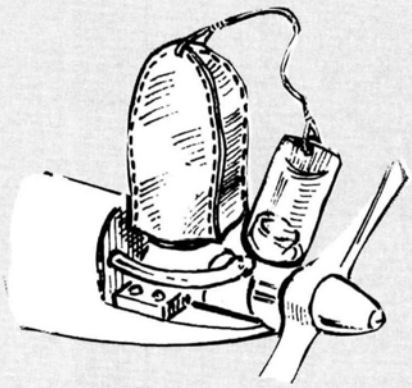
FUEL GAUGE

Here's a fuel gauge for "biggies"! Solder two brass-tube elbows into the end of the fuel tank, then connect them with clear plastic fuel line. When you're calibrating the gauge, remember that the quantity of fuel that's visible will vary according to whether the plane is tail up or tail down. (Gauges on full-size airplanes show both.) Since liquid finds its own level, you can extend the piping forward, e.g., to just inside a radial cowl, and see its contents at a glance.



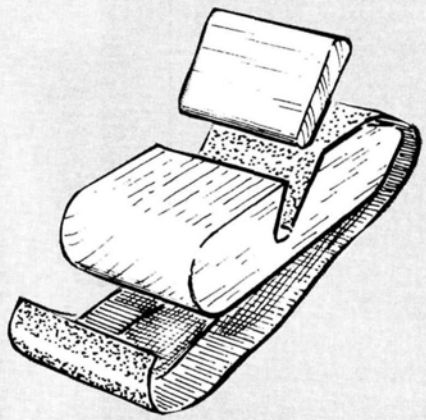
RIB CARE

It takes more than ordinary care to avoid damaging ribs when you use a sanding block on a trailing edge, so why not protect the ribs with cellophane or masking tape before you start sanding.



KEEP CLEAN & WARM

A finger from an old glove keeps flying grit out of parked engines and also keeps the cylinder warm between flights. Attach one end of a length of R/C hookup wire to the "finger" and the other end to a piece of large plastic tube (sealed at one end). The tube slips over the venturi to complete this useful pair!



SANDING-BLOCK PROTECTION

To strengthen the sandpaper on commercial sanding blocks, stick masking tape onto the back of it. You could tape only the edges, or cover all the back with tape so that the sandpaper and tape will be of uniform thickness across the block.

AIR SCOOP

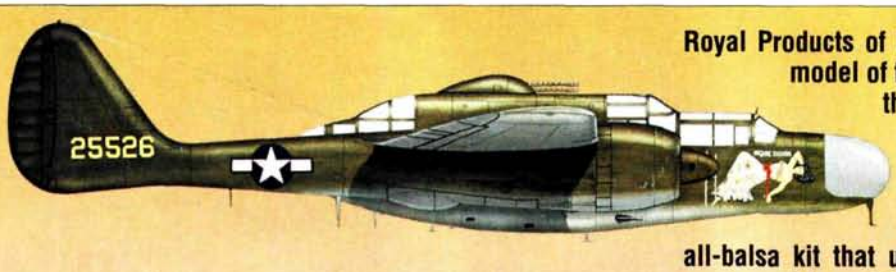
by CHRIS CHIANELLI

New products or people behind the scenes—my sources have been put on alert to get the scoop! In this column, you'll find news that will, at times, cause consternation, and telepathic insults will probably be launched in my general direction! But who cares?—it's you, the reader, who matters most! I spy for those who fly!

He Shall Return

Just as the February issue with my "Air Scoop" report on the Tournament of Champions was hitting the stands, I received a letter from Hanno Prettner. It detailed the incredible preparations he had made for the TOC—practicing maneuvers and tuning his aircraft—only to have his efforts thwarted by a case of gallstones that put him in the hospital for eight days. The doctor ordered, "No go, Hanno!"

Shown here are Hanno's brand-new O.S. BGX -1 -powered Extra 230 (which he claims can do 30 consecutive vertical rolls!) and his ACRO Sport II bipe. The ACRO has the well-known gear drive, and it's now equipped with two O.S. .91 ABC engines with tuned pipes—a combination that delivers 8hp with a 22x14 Anso prop! Obviously, Hanno will be back at the next TOC with both barrels loaded and intent on reclaiming his throne! We all hope he's fully recovered and ready to blow us away with the Hanno "screw." Watch out!



ROYAL WIDOW

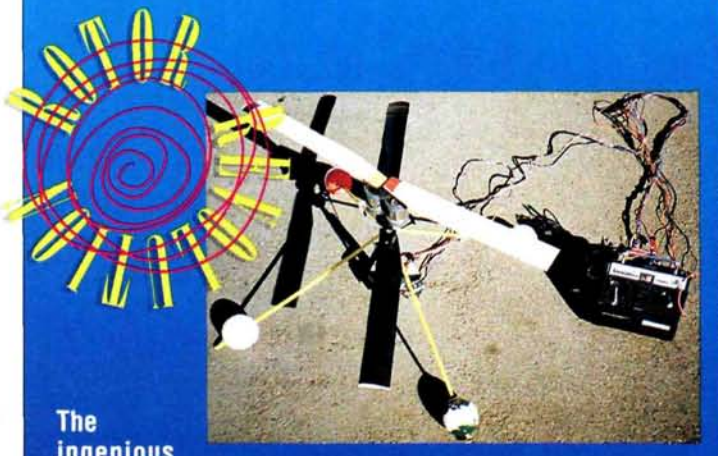
Royal Products of Denver will soon offer an R/C model of the only American night-fighter that was produced during WW II. The Northrop P-61 Black Widow, which unleashed deadly "night fire" against the Germans and Japanese, is an all-balsa kit that uses .40- to .60-size, 2-stroke engines. It has a 71 15/16-inch wingspan and a generous 790-square-inch area, and its wing planform is excellent for modeling. The plane is scheduled to be released in late spring or early summer.

FLY BEFORE YOU BUY

—that's the new Hobby Lobby policy!—well, not quite, but it's certainly the next best thing. Hobby Lobby will soon offer videos, each showing three of its kits. The videos not only include performance footage of the planes (which are built in-house at HL), but mild-mannered Mr. Martin also describes each kit and lists the tools and materials you'll need to complete it. The best part?—if you buy one of the kits, the company will refund $6 of the video's $9 price! Although I'm not an electric-flight devotee, I was so impressed by the Graupner Race Rat's performance that I ordered one! You can't fake that flight footage. What a great idea!

TROPICAL FUN FLY

Here's Charlie Hampton of Polk's Hobbies enjoying the fruits of his R/C stardom in Costa Rica! This Central American country has been the site of a tropical fun fly for the past eight years. Many American R/C celebrities—Dave Sculley, Dave Brown, the Sun Dancers' Don Lowe, the Miniature Aircraft Team, etc.—have been going there to enjoy the flying and the beautiful tropical scenery and weather. Charlie has participated every year and works with Julio Pastora, whose dream is to have a Pan American fun-fly event. If anyone is interested, contact Charlie at Polk's Hobbies, or see Julio Pastora at the upcoming Toledo show.

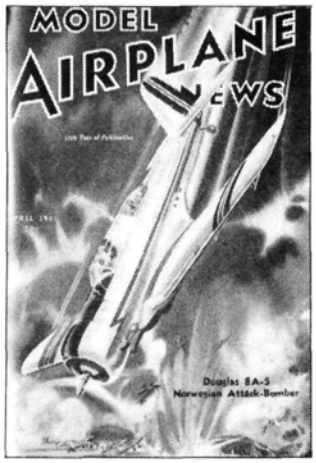


The ingenious Capistrano Aerodumpmasters have flown a proof-of-concept R/C Heli-Vector—the unusual craft in which the pilot rides above the rotors. Based on the original design by Theodore von Karman and Stefan von Petroczy (see the October '90 issue of MAN), the Mabuchi 05-powered R/C model uses counter-rotating, variable-speed rotors for yaw control. Directional control is achieved by means of movable weights (servos). The Aerodumpmasters experimented with blade/rotor-speed configurations, and the prototype is stable in flight. Dave Raubinger designed the mechanics; Dave Herbert installed the radio and first-generation electronic mixers; and Dave Schnell is working on electronics enhancements.

FIFTY YEARS AGO

THE COLORS OF WAR

by KATHERINE TOLLIVER

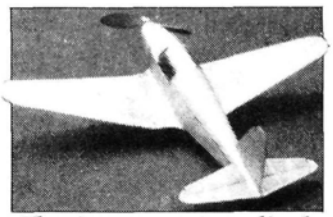


THE SKY is fire red. A direct hit wreaks havoc on a German airfield and, in the foreground, a Douglas 8A-5 flying under Norwegian colors goes in for another strike. Jo Kotula's colors of war on the April 1941 cover were vivid.

The Douglas A-5—a low-wing, cantilever, single-engine, monocoque, two-seat attack bomber—had retractable landing gear, and it was powered by a single, radial, air-cooled engine. The landing gear folded inward into special "dishpans" located forward of the wing-to-fuselage joint. The single Wright Cyclone, nine-cylinder, air-cooled, radial engine, which was mounted in the nose, was the conventional tractor, full-cowled version. The wing was constructed of eight spars, and it was divided into five main portions. One of the most heavily armed attack bombers of its class, the Douglas 8A-5 had a wingspan of 47 feet, 9¼ inches, and a wing area of 364 square feet. Its wing loading was 20.7 pounds per square foot of wing area.

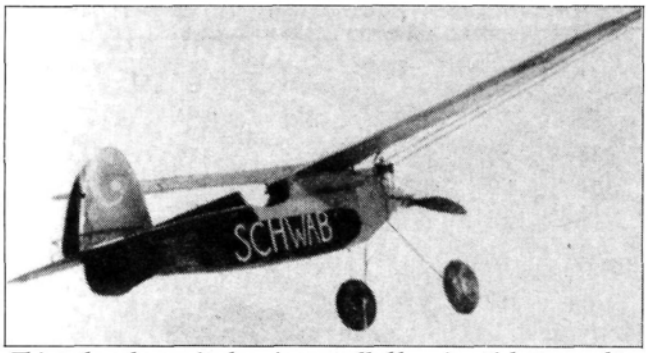
SOME STRINGS ATTACHED

How about a miniature pursuit model that you could control and maneuver from the ground, but that couldn't fly away? The author of "Controlled Lightning" reported that "just for the fun of it," he took one of his older planes and connected a string to the wing tip, one third from the leading edge. He then glued a tab to the rudder and the wing so that the ship would pull away from the operator or turn sharply to the left with the ship flying in a clockwise direction. At half throttle, the ship left the ground and flew in perfect circles at about an altitude of 5 feet. That worked well until, one day, the motor was opened up too much, the ship climbed to about 50 feet, "the string tightened, down went one wing tip—well, the rest of the ship followed."



The Aeroneer—streamlined, graceful and easy to build.

After several weeks of rebuilding and experimenting, two strings were used for up and down flipper control and, attached to a small joystick, they also supported the ship while it flew in circles. "I could actually set the ship on the ground with the motor running and, using the stick, raise the tail in flying position, pull it back and take off exactly as in a real airplane, climbing and diving the ship within a few inches of the ground and pulling it out without stalling or crashing." The enthusiasm of author William B. Schwab came through loud and clear in this article.



This tethered pursuit plane is controlled by a joystick strapped to the modeler's belt.

Some interesting models were pictured in "Gas Lines" that month. Donald Kilpatrick of Quebec, Canada, sent in a photo of his 7-foot, 3½-foot amphibian. He cited problems with its inverted motor (a 1936 Ohlsson): "After running spasmodically for a minute or two, it blew up. It wasn't just another backfire, for the force was so terrific that the model jumped clear off the floor." Apparently, little damage was done, but Kilpatrick said he planned to install a motor designed to run in an inverted position.

The Aeroneer—a realistic, simple, high-performance, rubber-powered sport plane—would have been a good model to add to your fleet. Its large propeller provided low flights, and its large wing facilitated ground takeoffs. After 75 winds, "the model should get away to a long, low climb, circling to the left a bit. After the power is exhausted, it should come in on a fast, flat glide."

"Flash News" reported that the Coast Guard's new Consolidated PBY-5 had a new bombing rack in its underside (aft of the rear step) to hold "one of the most remarkable aerial cameras ever designed." Fitted with nine lenses, the giant camera could photograph 300 square miles from 21,000 feet. Equipped with special filters, the 31-inch camera weighed 750 pounds.

The "Instructor" (*MAN's* anonymous reporter) had some good advice about the controversy surrounding the types of planes that modelers should use. "Let's quit trying to tie up modeling with the high-speed areodynamics of full-scale aviation. Let's encourage ships that will last, that will fly consistently and reliably. Let's make the sport appealing and worthwhile to a lot of people." *MAN* hasn't lost sight of those goals. ■

GOLDEN AGE
OF RADIO CONTROL

by HAL DEBOLT

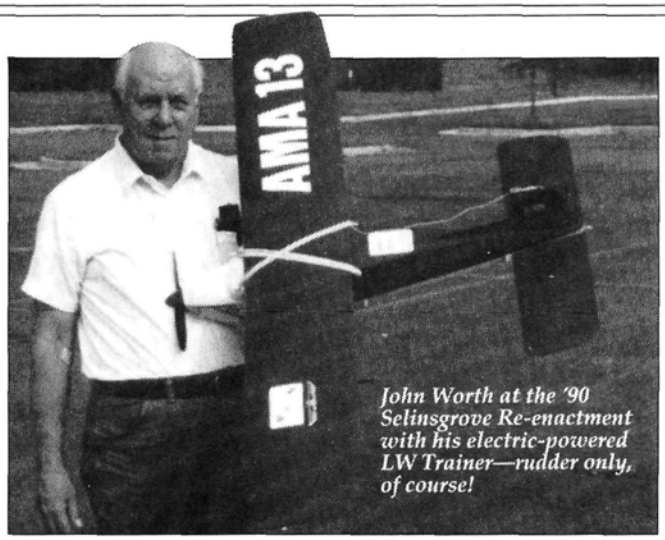
Mail call and the first ARFs

THIS IS YOUR OT R/C place, so I'll start with your input, but I won't be able to cover it all. Scott Wallace of Rock Hill, NC, is a pattern flier who enjoys OT R/C, too. He writes that he saw an ad for a LW Kitten in a '53 issue of *MAN*, and he had to have one. In the '50s, the kit sold for $2.95, but today, Scott paid $5 just for the plans!

Remember Hale Wallace and his wonderful early efforts? Recently, he has become interested in *giant* giant scale—1:1 Skybolts!

A CHAMP AT SELINSGROVE

The AMA's John Worth says I missed a lot by not being at Selinsgrove, and I *am* sorry I missed it! John's 10-year-old, electric-powered Champ made quite an impression, especially with one flight that lasted more than 25 minutes! John also sent a photograph of his LW Trainer, which is also electric powered. He powers it with a geared Kyosho motor that runs on nine 1200mAh cells. Weighing 3½ pounds, it has ample power for good flights with rudder only and motor cutoff. His Trainer reminds me of flying the original, which weighed a monstrous 6 pounds and flew with Schmidt 5-channel reeds and a Mills .08 diesel for power. It was a respectable flier.



John Worth at the '90 Selinsgrove Re-enactment with his electric-powered LW Trainer—rudder only, of course!

MICROFILM MODEL

Jack Stephenson of Gilford, NH, enjoyed reading about Ken Willard's indoor flying, and he wonders whether anyone remembers something even more outstanding?—an indoor, rubber-powered, *microfilm* R/C model? Jack and I can't recall the culprit's name, but one modeler managed to do it.

To appreciate this achievement, you must first remember that radio signals are energy and do work, such as generate heat, even if in very small amounts.

The system's transmitter put out an RF signal on 27MHz with 100 *watts* of power. The signal was pulsed in the usual pulse-propo way, and the rudder was moved in one direction by a thin rubber band. In the opposite direction (counteracting the pull of the rubber band) ran a piece of very fine Nichrome wire whose length was in exact proportion to the 27MHz wavelength. When Nichrome wire is heated, it stretches, and RF signals generate heat, so when a signal was received, the wire stretched; no signal?—it contracted. With the rubber band, these variations in wire length provided rudder control, which the pulsing even made proportional (and we thought we'd seen *everything!*).

NOW IN CALIFORNIA...

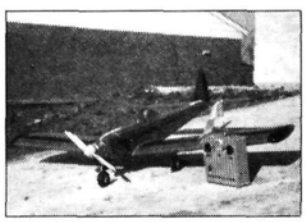
Peter Berg of Carlsbad, CA, first flew R/C models in the Netherlands, where the plentiful waterways made hydro flying popular. With a LW P-Shooter, Peter did well in float meets, and he also enjoyed flying the Jenny and the Acrobat—all birds of a feather.

Peter came to Indianapolis in 1967, and he and his P-Shooters were soon doing well there in fun-fly events. About 10 years later, he joined Kraft in California, where he helped to design industrial and FM equipment. He's still in California enjoying R/C and says that he always has a trusty P-Shooter ready to go—his *13th*! Can anyone beat that?

EARLY ARFS

How did R/C ready-to-fly, ARF and quick-build models start? In the '60s, the LW Champ was a typical design: styled for sport and training, it was relatively easy to build. Aerobatic types had complicated structures, and it took some time to prepare one for pattern flying. Phil Kraft needed a capable airframe that he could use to test experimental R/C systems. (He once said that he was tired of ruining perfectly good pattern planes while sorting out new R/C systems, yet this "sorting" was necessary.) If only they had a suitable airframe with *little* time invested in it—a flying "test bed."!

The need was met by what probably was the first fully aerobatic quick-build design, which, for aesthetic purposes, Kraft patterned after the Fokker Eindecker.


One of the first of Peter Berg's 13 LW P-Shooters. Note the World Engines Controlaire transmitter.

The LW Jenny was the first of the Dmeco quick-build series. Its 24-hour assembly was sensational at the time!

When local enthusiasts saw it, they realized its value and wanted one, too. Some smart alec quickly labeled it the "Ugly Stick" (a name that stuck!), and a local kit manufacturer put it into production and was kept busy for years! Now we know that other manufacturers got on the bandwagon, and we still see variations on what became the "Stik"—notably those by Midwest Products and Great Planes.

DMECO DECISION...

My company, Dmeco, was a leading R/C kit manufacturer at the time, and the appeal of the Ugly Stik was obvious to me. I decided to look into the possibilities of producing a quick-build Stik and to take the concept to "the ultimate." All those time-consuming building chores would be eliminated, and the number of pieces would be reduced to a minimum, but the design would still have to be easy to fly, fully aerobatic and *inexpensive*.

For the basic design, a number of unique features were conceived, one of which was the use of a plywood "box" for the forward portion of the fuselage, with a balsa structure spliced on aft of the wing. The strength of the plywood made the box very utilitarian: it eliminated the need for servo mounts, because the servos were simply bolted onto the fuselage sides. The items that are always subjected to the greatest stress (wing, landing gear and engine mounts) were attached to the box with no need for reinforcements! All the parts came *finished*, and we devised a simple universal radial engine mount that even included rubber shock mounting—in the early '60s!

The simplified wing had a hefty spar onto which the ribs were slipped, and they were held in position by the notched and shaped leading and trailing edges. When the parts had been assembled and the alignment checked, all the joints were glued to finish the structure. There was no need for jigging or fitting, and a wing could be ready to cover in one hour!

Naturally, these ready-to-assemble parts had to be precise, and we ensured that they were with extensive machine tooling that allowed us to produce accurate parts in *volume*. (We wanted to take advantage of economies of scale and meet the anticipated large demand.)

READY IN 24 HOURS

Our first kit followed the Ugly Stik design and was a shoulder-wing plane (for utility). Its name?—"Jenny," which we "borrowed" from the Curtiss Jenny of barnstorming fame. The Jenny was even better than we expected: very docile in

Hal and Scott Wallace's LW Champ and Kitten.

flight, yet fully aerobatic. Many were used for sport flying, and a couple even won the Intermediate Class at the Nats (demonstrating its maneuverability). One even qualified in a Nats pattern event, competing against exotic pattern designs; in fact, the Jenny proved to be all that many modelers of the time wanted.

Our advertising pitch for the new Jenny kit was "24-hour assembly." We claimed that you could have an airframe ready to cover in less than 24 hours, but some modelers claimed times as short as 15 hours! It took longer than that to silk and dope the airframe!—too bad that today's film coverings weren't available then!

Following the shoulder-wing Jenny's success, demands were soon heard for other configurations. Dmeco's first reply was a low-wing version named after the first low-

(Continued on page 22)

GOLDEN AGE

wing pursuit plane, the Boeing P-26—"P-Shooter" seemed an appropriate nickname.

Our first inclination was just to put a wing on the bottom of a Jenny, but when we thought about it, we realized that increased sophistication was desirable. The P-Shooter therefore included all the Jenny's salient features as well as tricycle landing gear and other innovations to enhance its appearance. Even the gear was simplified with the addition of a "bottom-mounted" nose gear.

The P-Shooter enabled sport fliers to add a quick-build low-wing to their projects' roster. Peter Berg's experience with them was typical—sport pylon racing and fun-fly activities.

FINALLY, A BIPE!

The final plane in the 24-hour series had to be a biplane. For this, the Acrobat's design proved to be competitive with the best in pattern events. Obviously, its fundamental features were borrowed from the Jenny, but experience with the LW "Custom" bipe was also called upon.

Considering the desire for simplification, our major concern was the need for cabane struts. The traditional wire concept was, and still is, too complicated, and we eventually made the cabane struts integral with the fuselage's plywood-box sides. The plywood was precisely machined, and the struts were part of the sides—all in one piece. This was ingenious in that it also ensured correct wing alignment—automatically! The wings were attached with Cam-Loc fasteners, so no rubber bands were needed! What could be easier? Unlike traditional biplanes, in deference to modelers' wishes, the Acrobat had a tricycle gear, but later two-wheel-gear versions handled just as well on the ground.

The entire 24-hour Series was designed to use the popular .40 engines, and even the 1,100-square-inch Acrobat did well with them!

So the "quick-build" concept got off the ground and helped many of us to get airborne faster. Today, we see all sorts of efforts to carry the idea further, and I'm sure we appreciate the reduction in construction time. ■

ED KAZMIRSKI—

Big Ed Kazmirski with his Taurus. He was R/C's first World Champion and the '61 and '62 National Champ.

RC'S JOE LOUIS?

THE Champion of Champions, big, genial Ed "Kaz" Kazmirski began in the Chicago area during the late '50s. He took to reed-style pattern flying and quickly established a preference for Orbit equipment. This led to a close relationship with Bob Dunham that lasted throughout his career. Separated by thousands of miles, the two were friendly rivals who pushed each other's performance.

Kaz first competed seriously with an Orbit, reed-equipped, Astro Hog powered by Johnny Brodbeck's "Green Head" Torps. Like Dunham, Kaz modified the Hog into a plane with superior performance, and he soon made a name for himself in the Midwest. He burst onto the national scene with convincing performances at the prestigious Detroit Invitational meets.

The members of the USA's first FAI World Champ team were chosen from areas—East, Midwest and West—and since Kaz was number one in his area, his place on the team was assured. He joined Bob Dunham and me, with Walt Good as team manager, and he and Bob took their rivalry to the world champ level.

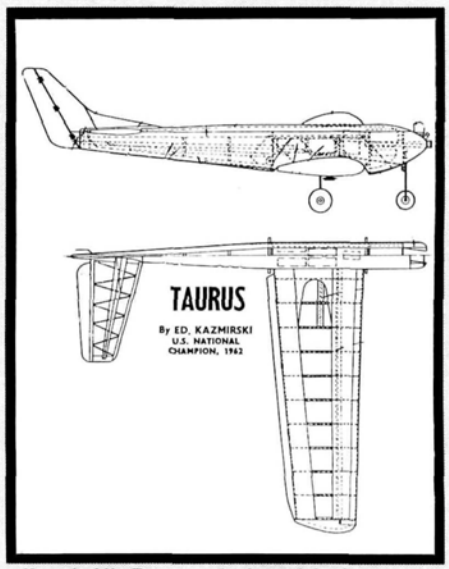
For the World Champs in Zurich, they both came up with new designs that went on to become the foundations for all pattern designs. They used the then-new Orbit "relayless" reed system, which was lighter, maintenance-free and the ultimate in reed development.

Kaz called his the "Orion," and we know how it dominated the World Champs after Dunham's engine problems took him out of the running. Kaz was an outstanding first World Champ, and his name was soon widely known in R/C circles. Following his achievement, the Orion was kitted by Top Flight and quickly became *the design* to fly in competitions. Kaz won more major meets with it, including the '61 Nats.

Kaz had a sharp eye for competition needs and, armed with the lessons learned with the Orion, he went on to what was probably the finest reed-controlled design of all—the Taurus. He demonstrated the ability of this one with major wins, including the '62 Nats. The Taurus was also successfully kitted by Top Flight, and to round out his kit designs, Kaz produced a trainer—the Tauri.

At this time, proportional control came into being, Orbit switched to it, and Kaz apparently had great difficulty converting from reed control. If you haven't flown both, trust me: the change in style it involved was dramatic! Kaz gave it a try, but resorted to a really large design in his attempt to make the transition. This wasn't the answer at that time, but we do see similar designs used today!

Kaz's reign as R/C king seems to have ended when his machine business began to demand more of his time. He had already earned R/C's highest honors, and afterward, he had other priorities. Those of us still in R/C have undoubtedly missed his genial personality and outstanding abilities, both as a designer and as a pilot. Hats off to the champ!



Kazmirski's Taurus—the last of the "reed era" Nats champs and very popular.

PILOT PROJECTS

A LOOK AT WHAT OUR READERS ARE DOING!

SEND IN YOUR SNAPSHOTS!

MAN is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable.

All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of 1991. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in !

Send those pictures to:
Pilot Projects, Model Airplane News, 251 Danbury Rd., Wilton, CT 06897.

LAFAYETTE ESCADRILLE

This flight shot was sent in by Bob Boulgis of Vernon, CT. The 4-stroke Saito-.50-powered Nieuport 17 was built from a Flair Legionnaire kit. It's covered with Coverite, painted with dope and finished with Coverite clear satin. The model is fully rigged with Proctor hardware and has a functional landing-gear suspension. It flies beautifully, but it's a bear to taxi.

WILDCAT DOWN UNDER

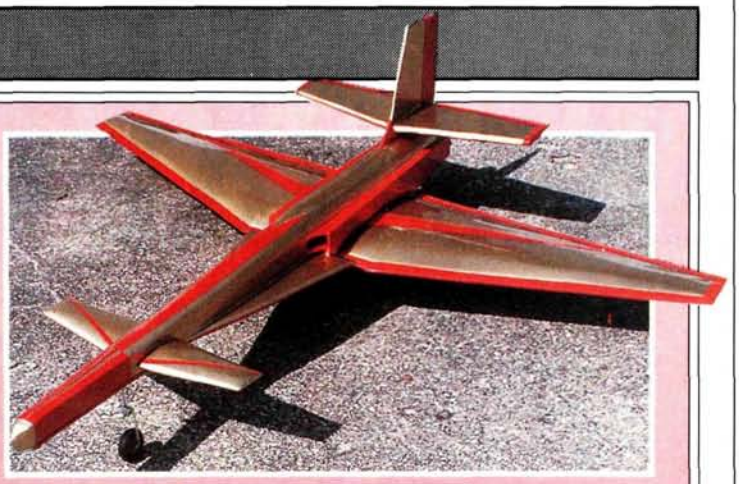
This impressive F4F-3 Wildcat Navy fighter is the work of Ray Botten of Wanniassa, Australia. The idea for the project was fueled by a construction article on the Scale Wildcat landing gear (*MAN* '82). Ray enlarged the model by 10 percent for strength, and his plane ended up with an 85-inch wingspan. Powered by a Super Tigre 3000 swinging an 18x6 prop, the model has placed 2nd in scale contests. With an all-glass fuselage, it weighs 27 3/4 pounds.

COIN FIGHTER FROM MARS

This Scorpio Mystere 3000 comes to us from Mars, PA. This model is L. David Richards' version of a COIN fighter, and it has wing-mounted Estes rockets (no motors!) and an internal bomb-bay system with a functional bomb drop. Powered by a Super Tigre S61K ABC engine, David says it flies very well and is extremely responsive. The canard configuration allows for very slow, safe landings without tip stalls.

HE FLEW SHAMU

This picture of an Orca-Sport, which was sent in by Capt. Alan Reynolds who's stationed at Barksdale AFB in Los Angeles, CA, is really a Great Planes Ultra Sport .40. The unusual paint job was inspired by the dolphin shape of the fuselage. The model is covered with Coverite and painted with Black Baron paints, and the small, killer-whale icon on the rudder was hand-painted.



STRATOWING XP .40

Bob Robinson of Central Islip, NY, scratch-built this "beastie" from Craig Efstratis plans and finished it with gold and red Oracover. Powered by an O.S. 46 SF ABC spinning a pusher prop, this 54-inch-long model has a 59-inch wingspan. Bob uses Futaba electronics to guide this lethal-looking canard.

GLASAIR IN THE DESERT

This Byron Originals Quadra-35-powered Glasair TD is the handiwork of Youssef Gallad of Heliopolis, Egypt. Youssef is a Byron "fan" (not ducted!), and his model was once chosen as "Model of the Month" in the Byron Originals' newsletter. The 19-pound Glasair is 75 inches long and has a 90-inch wingspan. (Check out the pyramids in the background!)

POWERFUL PEASHOOTER

J. Grant Price of Oakland, CA, built this P-26 from a Royal kit. Powered by an O.S. 120 FS and guided by a PCM Futaba Conquest, this 14-pound Peashooter is painted with Poly-S paint and sealed with Black Baron gloss. It flies fine, but its landings are touchy, owing to its narrowly spaced landing gear.

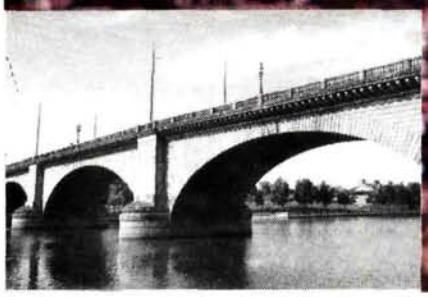
CITABRIA FLOAT CONVERSION

Mike Dilulio of Moline, IL, sent in this photo of his float-converted Sig Citabria. Mike converted its wheels to floats after reading John Sullivan's article on foam-core floats (Oct. '90 *MAN*)! Powered by an O.S. 46 SF swinging a 12x6 prop, the model lifts off in about 60 feet at three-quarter throttle. Its all-up weight (with floats) is 7.7 pounds, and a 4-channel Futaba radio wags its wings.

Cliff Adams' Supermarine roars toward pylon 1 with Lake Havasu City in the background. This ship hit close to 100mph in the straights!

2nd annual Schneider CUP

by JOHN SULLIVAN



THE HAVASU Desert Hawks have staged their second Schneider floatplane extravaganza, and now I can sit back and make comparisons in much the same way as I'd savor the merits of two fine wines. From experience (with floatplane meets, not wine!), I can tell you that both the '89 and '90 events were worth the price of admission; it's just that this year's event was a little more robust!

Cliff Adams starts the custom O.S. 4-stroke, four-cylinder powerplant on his 33-pound Supermarine S.6B while his crew hangs on.

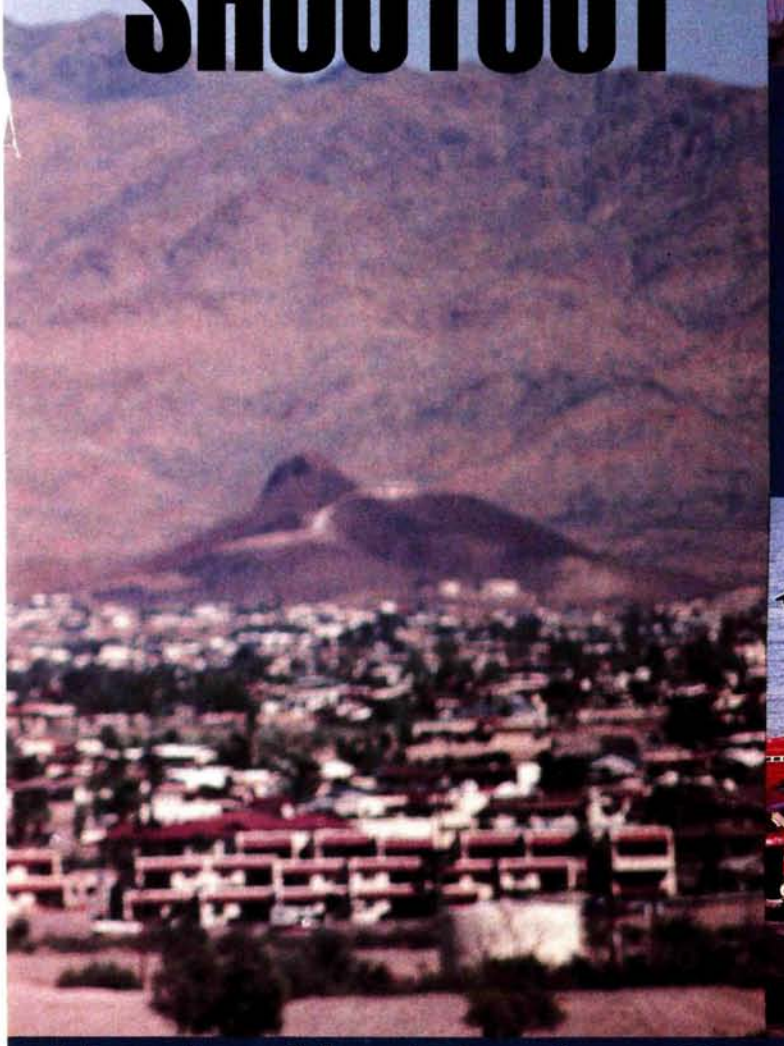
ON THE ROAD AGAIN

The drive from northern California to Havasu was as uneventful as ever (I shouldn't complain; one of the entrants came from Juneau, AK!) and, once again, we arrived in the middle of the night. As usual, Mike Johnson and I had trouble convincing the desk clerk that the two half-dead individuals standing in front of her *were* representatives of *Model Airplane News*.

That's where the similarities between this year and last ended. This year,

GIANT-scale seaplane SHOOTOUT

■ *ABOVE: Rich Irwin looks on while Chuck Fuller works on Larry Sutherland's Macchi M-33 between heats.* ■ *RIGHT: PEC team member Steve Rensel waits for a signal to release the plane in the fourth heat. The performance of the Sachs-powered Curtiss was incredible.* ■ *BELOW: Harland Warwick and Jim Rasmussen survey the damage to their Supermarine S.6B (it looks repairable). This beautiful ship scored a 92 in the Static event. These intrepid modelers also entered a Curtiss R3C-2.*



VINTAGE 1990

The 1929 Savoia Marchetti S.65 (by Mike Johnson and me) took top Static Honors with 98 out of 100 points. During the flight competition, the plane had engine problems. (Broken elevator actuators put the Savoia in 10th place.)

we actually had an entry—the Savoia Marchetti S.65—and this entitled us to store our plane in the convention center with the others.

Entering the convention center at 1 a.m. was like walking into a deserted museum that's dedicated to the preservation of historic floatplanes. There, in the dim light, sat 30 of the finest scale renditions of Schneider racers you'd ever see. A guard followed us around as we picked out new entries (the variety of aircraft had increased by 40 percent). It was close to 2 a.m when we brought in our Savoia. We found our room, asked the desk clerk to give us a 6:30 a.m. wake-up call and passed out.

CD Bob Lake kept the pilots grounded for two days while the wind blew at 30mph with gusts up to 60mph! High winds are a particular problem for floatplanes.

WINDY WELCOME

On Friday morning, the wind was blowing at 30mph with gusts up to 60mph! Event chairman Bob Martin welcomed the participants and spectators who had gathered in the convention center. Then he turned the microphone over to CD Bob Lake. Bob apologized for the weather and explained that the Static judging would continue through noon at which time there would be another pilots' meeting to discuss contingency plans.

In a way, the wind was beneficial. It kept everyone focused on the Static event and gave judges Jack McCracken, Bill Stromen and John Eaton more time to judge. The models were judged on their scale accuracy, craftsmanship and finish—with a possible total score of 100 points. Within minutes after the totals had been compiled, the results were posted on a large chalkboard that stood next to the judging area.

Ken Merril's Curtiss R3C-2, Team Macchi's Macchi M67, and Richard Pasqualetto's Macchi MC-72 all earned scores of 93! Close behind, with 92 points, were Ian McInnes and Roy Slater (who both had Sopwith Tabloids), and Jim Rasmussen's Supermarine S.6B. The rest of the field were close, with scores in the mid- to high 80s.

When it was time to judge the Savoia, we carried our year-long effort to the turntable and stood in shock while the judges examined the plane and its documentation. When it was over, we took the Savoia back to our display table and tried to look inconspicuous until Bob Martin came up and said, "Well, I don't think you're going to be happy with your static score."

"Why not?" I asked, "Did we get a 50?"

"No," Bob replied, "You only got 98 out of 100!" We were in 1st place with a 5-point lead!

At noon on Friday, Bob Lake held another pilots' meeting. The wind hadn't diminished at all, and the Schneider committee had decided to scratch the speed trials scheduled for that afternoon. There

...and the winners are! PEC's president H.L. Scates and team members Felix Ceja, Steve Rensel and pilot Ken Merril pose proudly with their 1925 Curtiss R3C-2.

Ian McInnes held on to 1st place for three heats and wound up in 3rd place with his 1914 Sopwith Tabloid.
Old-timer planes were judged fairly at the Schneider race.

would be a pilots' meeting at 7 a.m. the next day, and weather permitting, they would attempt five heats on Saturday and hold the awards ceremony on Sunday.

No one exactly *ran* to the pilots' meeting on Saturday morning. Again, Bob Lake sympathized with all of us (I commend him for his concern and judgment throughout the event) and called for additional meetings at noon and 4:30 p.m. The display and sales booths were moved into the convention center, which was packed, and everyone used the time to shop and talk.

At noon, a show of hands scratched the Saturday afternoon attempt. Several pilots went to the beach to see if there was any possibility of flying, and they returned shaking their heads. The FBA-27 group, led by pilot Maurice Morgan, actually put their immaculate, kite-like, 1914 entry in the water, and they watched in horror as the wind "cartwheeled" the delicate old-timer all the way to shore at a cove a 1/4 of a mile away. Miraculously, the FBA-27 wasn't damaged by its wild ride.

At 4:30 p.m. on Saturday, all the pilots gathered in the computer room for a "do-or-die" meeting. The mayor of Lake Havasu City arrived to take some of the load off Bob Lake's shoulders, and he was warmly received. In the end, it was decided to attempt four rounds on Sunday morning with awards at noon.

SCHNEIDER RE-ENACTMENT RACE RESULTS

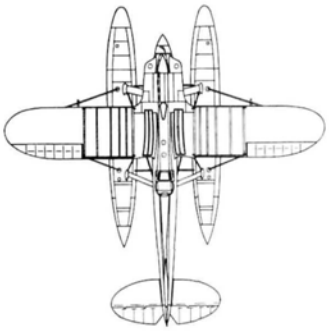
Place	Pilot/Team	Plane
1	Ken Merril	Curtiss R3C-2
2	Team Macchi	Macchi M-67
3	Ian McInnes	Sopwith Tabloid
4	Richard Pasqualetto	Macchi MC-72
5	Roy Slater	Sopwith Tabloid

THE FLYING BEGINS

Sunday morning was calm and sunny. Desert Hawks' personnel were on the beach at sunrise to set up the pylons and buoys and fence off the pit and impound areas. Pilots were briefed on the procedure for the heats. For each flight, they could receive up to 10 points in five areas: takeoff, course adherence, altitude (10 to 80 feet), and scale-like speed and landing, making a maximum of 50 points. Scores for the best three heats would be averaged for a final score. Flight judges Adam Gilbert, Paul Curley and Harry Apoian were introduced, and flight-line director Jack Polster called up the racers for the first round in the first heat, and we were in it!

TAKEOFF TIME

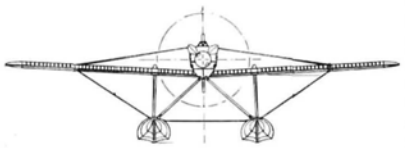
The S.65 started on the first flip, and we thought we had it made. The planes were carried



ABOVE: Here's an overhead view of a Gloster IV
BELOW: An unidentified pilot flips his Macchi in Sunday morning's early light. The Desert Hawks managed to stage the pylon race with four heats in 4 hours.

Schneider CUP

ABOVE: Last year's winner, Robert Heitcamp, heads for the flight line with his 1925 Macchi M-33. Bob tied for 1st in the first heat and then slipped to 11th when his plane had engine problems. BELOW: A drawing of the author's plane—a1929 Savoia Marchetti S.65.



to the water, engines gunning, and set loose. Three of them turned off the taxiway at the same time, and all three hit the throttle. The Savoia surged forward, throwing a cloud of spray, and climbed up on step, but it was quickly passed by the other planes.

Mike ran the Savoia all the way down the buoys, but he couldn't get the Zenoah G62 on pipe. He turned and tried a second run, but to no avail.

Meanwhile, in the background, I heard the engine on Team Macchi's M-67 quit and saw Doug MacMillon's beautiful Supermarine S.6B crash. Mike taxied the Savoia back to shore to lean out the Zenoah, and we were called out of the heat. After basking in 1st place for two days, we had totally smeared our first flight attempt!

Jack Polster and Mike Mehus called planes up for the next rounds and filled the spaces on the prep line. The Desert Hawks were hell bent on flying four heats with 30 planes in less than 4 hours, so the pace was brisk—firm and absolutely driven! When the first heat had ended, Ian McInnes's 1914 Sopwith Tabloid and Bob Heitcamp's (last year's winner) new 1925 Macchi M-33 were tied for 1st place. Jim Rasmussen's Supermarine S.6B was one point behind in 2nd, and Richard Pasqualetto's Macchi MC-72 held 3rd. Ken Merril's Curtiss R3C-2 and Roy Slater's Sopwith Tabloid were tied for 4th, and another R3C-2 (flown by Harland Warwick) was in 5th. (It's important to note that several of this year's judges had experience judging old-timers. This put the old Tabloids, Macchis and Deperdussins on an equal footing with the newer, sleeker bombs, and the judges' decisions really turned some heads!)

The second heat began with seven planes bunched in the first five places with only 10 points separating them. Again, Mike Johnson and the Savoia were in the first round, and the G62 got ornery! After priming and changing the plugs four times, Mike finally got the Savoia running and leaned out. He taxied the plane to the takeoff line and hammered it. It had more power, but still not as much as it had during testing. Mike ran the Savoia until it was time to take off, rotated it and the Savoia lifted off. Its speed was adequate, but only barely, and Mike began to complain that its elevator response was softening. He finished the 10 laps and immediately pulled the Savoia into the landing pattern. Just before final flare, the plane nosed in and bobbed back upright. Something was definitely wrong.

In the air, the pace never slowed down. Four more planes went in during the second heat, and all the tied scores had been decided. Everyone cheered as McInnes's Sopwith Tabloid made majestic flights to hold on to 1st place. Rasmussen's Supermarine S.6B held on to 2nd, and Slater's Sopwith broke out of its 4th-place tie and moved up to 3rd. Merril's R3C-2 stayed in 4th, and Dick Skogland's 1913 Deperdussin jumped into 5th when Warwick's R3C-2 scratched.

Two hours had passed, and we were already starting the third heat. The field was down to 11 planes. Mike picked up the transmitter for the first round of the third heat and turned on the Savoia. Everything worked except the elevator! We stood the plane on its nose, tore off the access hatches on the stab underside and peered inside. Both of the Swingee elevator actuators had completely broken off

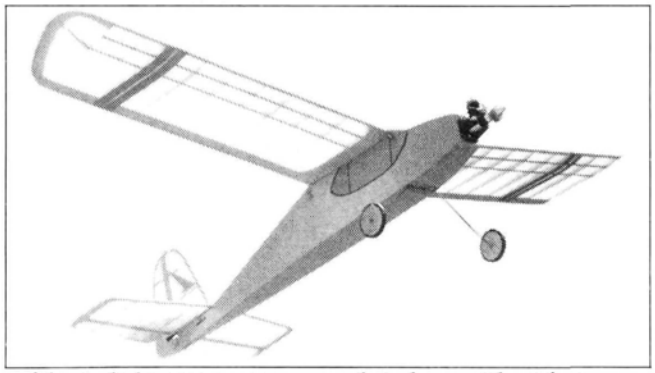
(Continued on page 92)

BASICS OF

OF RADIO CONTROL

by RANDY RANDOLPH

Smaller engines are gaining power



If they're light, .049- to .075-powered airplanes with a 4-foot span (or larger!) will perform as well as planes powered by engines with two, three and even four times the engine displacement.

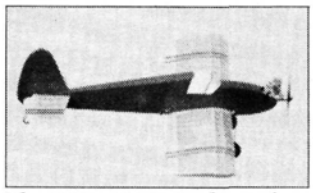
WHEN A NEW modeler asks an old-timer what size is best for a second airplane or an intermediate trainer, almost without exception, the old-timer will recommend an airplane with a .40- to .60-size engine. It's not a bad recommendation, but it's a little outdated.

Years ago, it took an engine with a displacement of at least .40 cubic inch (which I'll call "larger" for the purposes of this article) to produce enough power to fly a semi-aerobatic airplane with a 50- to 60-inch wingspan. Today's .20- to .26ci engines (both 2- and 4-stroke) produce almost as much power as the old .40 engines, and they're lighter and more fuel-efficient.

Kit manufacturers still produce the traditional .40-size trainer/sport planes because they offer retailers both volume and profit. Although the cost of producing a .40-size kit is about the same as producing one in the .20 to .25 range, the larger *engines* cost more. In fact, a few years ago, larger engines cost from 40 to 75 percent more than smaller ones.

SMALL KITS FOR SMALL ENGINES

Don't misunderstand, without volume and profit there wouldn't be the selection of kits that's currently available, but things do change. In the last few years, several companies have started to manufacture more kits for .20-size engines. Although smaller engines cost more (they're almost as expensive as the larger ones!), they still offer a couple of advantages. Using one in a 50- to 60-inch-span plane reduces the plane's weight, and that improves its flight performance. Further, the engine uses less fuel, and this reduces the operational costs.



The .20 to .26, 4-stroke engines are strong, quiet and fuel-efficient—perfect for weekend sport flying.

In the .10 range, there are some outstanding engines that have as much power as the old .25s. In fact, there has never been a better selection of them. Manufacturers such as O.S.*, Enya* and Super Tigre* have modified their R/C car engines for use in R/C aircraft. They have power capabilities that were once available only in custom-made racing engines, and they produce this power with mufflers in place! No small consideration is that their throttles are every bit as smooth and responsive as those on any engine, regardless of size.

Engines in the .049 to .075 range have always been popular because the airplanes they power are relatively inexpensive and easy to build. Ace R/C* has championed such engines and planes and still produces more kits for this class than any other company. As an indication of the power generated by these 1/2A engines, there's a very popular kit on the market called Piece O' Cake; it sports a wingspan of over 70 inches, and it's a great trainer, too!

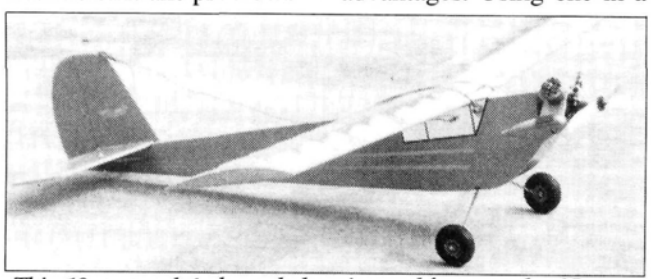
The G-Mark* .061 and the Cox* Queen Bee are equipped with true throttles. As far as power is concerned, their performance is about the same, although the G-Mark has slightly better throttle response. These engines make 4-channel operation for small airplanes practical and rewarding.

ELECTRIC ENERGY

Electrics are the most recent entrants into the sport-airplane/advanced-trainer field. Although a medium-size electric motor with a battery and charger is slightly more expensive than a comparable internal-combustion engine, there's no additional fuel expense.

The selection of electric kits isn't as extensive, but it's growing. Kits that include a motor are common, and some kits even include everything (i.e. motor, battery

(Continued on page 36)



This .10-powered, 4-channel plane is a real frequency hog! It can fly for almost 30 minutes on a 4-ounce fuel load.

BASICS OF R/C

(Continued from page 34)

Enya 11-CX

The Enya 11-CX is a good example of the high-performance small engines that are available today. It can turn a 7x3 prop 20,000rpm while running with a muffler on sport-type, low-nitro fuel: that's close to 1/2hp! This Schnuerle-ported, aluminum-and-chrome beauty with double ball bearings on the shaft and a bushed rod should give that kind of performance for years. It weighs 4 1/2 ounces, so the power comes in a very small package!

and charger). Electric power isn't as flexible as that of glow engines, but they're great if noise is a consideration.

To answer the question of what your next airplane should be, you have to ask yourself a few more questions: how big is your budget, and how much building experience do you have? Where do you plan to fly, and how much space do you have in your car to transport the plane? If you don't have quick answers to those questions, get a second opinion.

**Here are the addresses of the companies mentioned in this article:*
O.S./Great Planes Model Distributors, *P.O. Box 788, Urbana, IL 61801.*
Enya; *distributed by Altec Marketing, P.O. Box 391, Edison, NJ 08818.*
Super Tigre/Great Planes Model Distributors.
Ace R/C, Inc., *P.O. Box 511 Higginsville, MO 64037.*
G-Mark Engines; *distributed by Cannon R/C Systems, 2828 Cochran St., Ste. 281, Simi Valley, CA 93065.*
Cox Hobbies, Inc., *350 W. Rincon St., Corona, CA 91720.* ■

New options FOR straight, scale Takeoffs

by KENT WALTERS

A rudder gyro enhances safety and improves scale realism

NO MATTER HOW well you've set up your scale model, during takeoff rolls, many factors come into play that can potentially cause a safety hazard. For this reason, a recent improvement in takeoff directional control—one that has been happening quietly at scale contests—is important.

As with full-scale planes, the scale pilot's ability to stay mentally "in front of" the aircraft—and to correct its bearing with rudder inputs—often requires extremely quick control actions. This is even more the case with models in which the tempo of activity is faster. The goal is to keep the aircraft tracking straight and true along the runway. Scale competitors are concerned about wind direction (or the absence thereof), gusts and how they can abruptly alter a model's roll-out heading before liftoff; but there are several other factors that also can adversely affect a model's heading before liftoff:

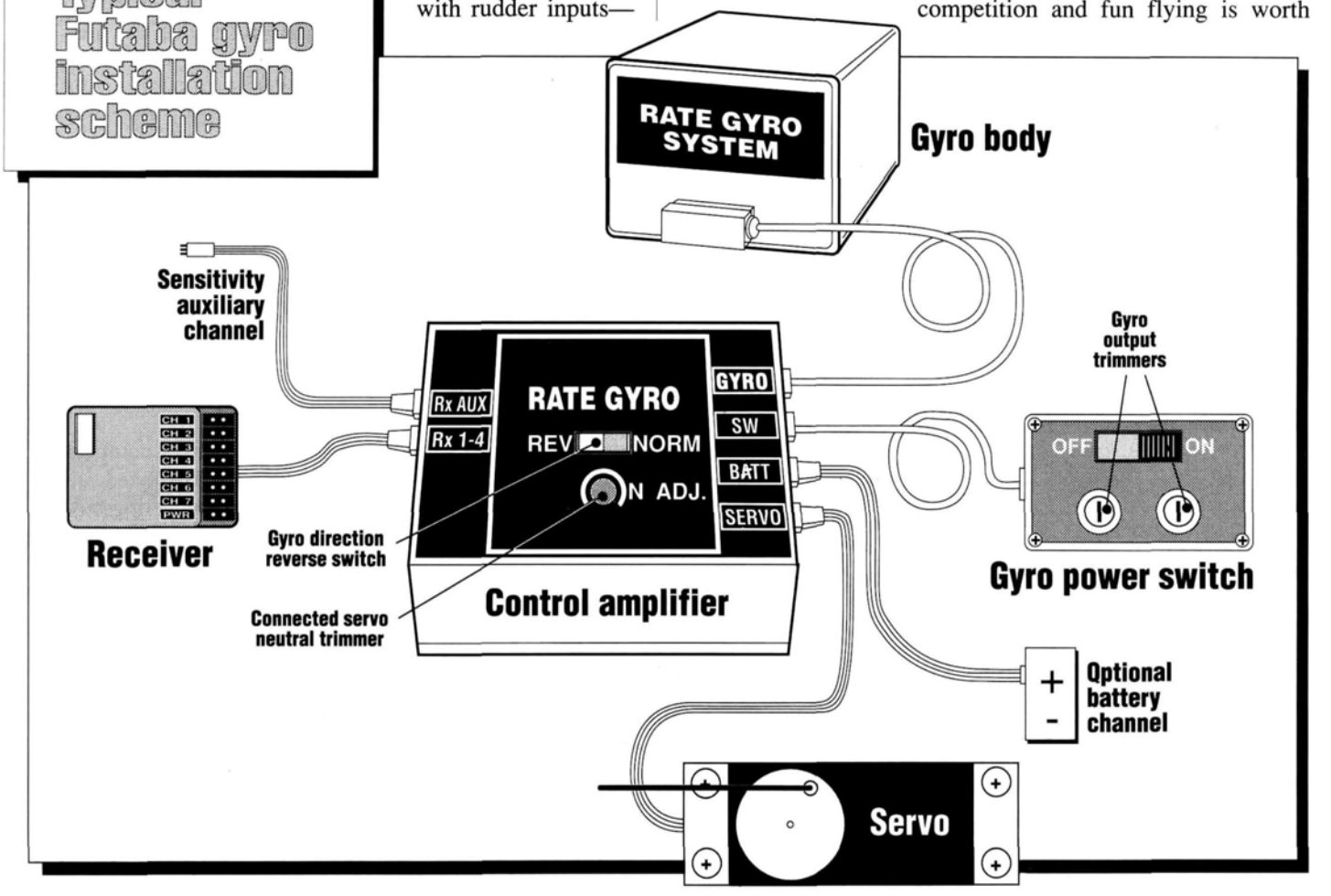
- specific scale airframe designs (relatively small vertical-stabilizer area)
- landing-gear design (e.g., tail-draggers)
- abrupt transitions from wheel-steering control to aerodynamic rudder control
- wheel alignment or drag
- P factor (gyroscopic reaction force exerted by prop disc)
- engine torque during throttle-up
- engine thrust relative to the center of gravity

These factors combine to form a gauntlet through which the pilot must struggle to maintain directional control. Unfamiliar runway facilities and contest pressure further increase the challenge. (This is evident even at the prestigious Scale Masters and Top Gun events, in which the best pilots perform.)

SAFER, BETTER SCALE PERFORMANCE

When used to assist rudder control, the rate gyro offers a significant improvement in safety, especially during takeoff, when many accidents occur. A practical means of improving safety for competition and fun flying is worth

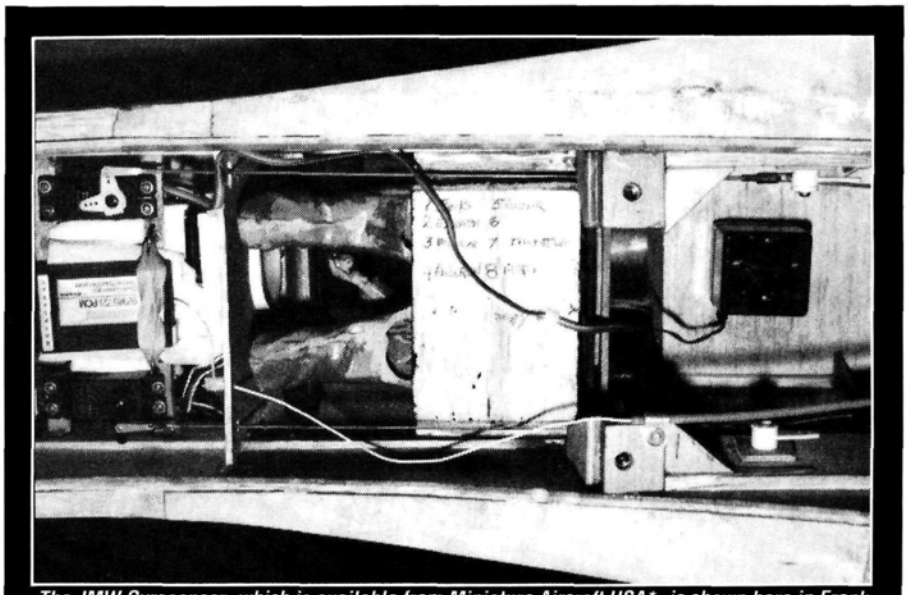
Typical Futaba gyro installation scheme



RATE GYROS

considering (heli pilots have used gyro control in the yaw axis for over a decade)—but there's more than safety to consider.

The use of rate gyros can generate an observable improvement in a model's performance by stabilizing it much like a shock absorber in a car's suspension or steering linkage. After seeing others getting very good results in a variety of scale aircraft, I recently put a gyro into my 15-year-old Ugly Stik. I immediately experienced a feeling of being more in command, with a comfortable scale "time basis," particularly during the takeoff roll. It also helps with landing roll-outs and any maneuvers that require agile rudder control to maintain a straight heading (including point-roll-type maneuvers).



The JMW Gyrosensor, which is available from Miniature Aircraft USA, is shown here in Frank Tiano's KI-61 Tony. The rudder servo is plugged into the gyro, which is plugged into the receiver's rudder receptacle. The gyro's on/off switch may be installed to work independently or with the radio receiver switch.*

A rate gyro can also lessen or eliminate Dutch Roll (which is partly caused by yaw oscillation). Simply put, it's an ideal help in damping the faster tempo of events (accelerated time) we experience in scale modeling. This "scale time" effect is an important element of "dynamically similar scale features" (the analysis of scaling down full-scale aircraft) in modeling.

HOW RATE GYROS WORK

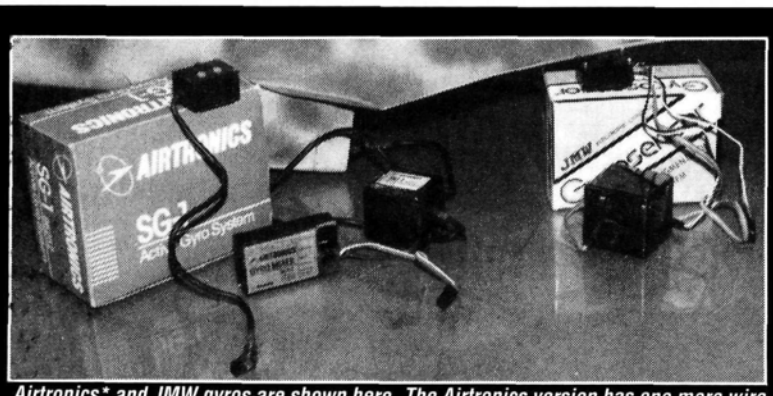
The rate gyro detects a model's angular acceleration (not direction) in the axis in which the gyro was installed. The detected motion, e.g., in the yaw axis, is communicated to a control amplifier that sends a counteracting signal to the rudder. The rudder then stabilizes the unwanted yaw-axis motion. Slower yaw movements aren't as well detected, but a pilot can easily override the control at any time. For example, in a takeoff roll, slower corrections may be required to prevent the plane from gradually drifting off the center line. The need for abrupt, "surprise" corrections, however, is minimized, and so is the safety hazard they pose.

Rate gyros can stabilize a model much like a shock absorber in a car's suspension or steering linkage.

As I've noted in previous articles on scale flight realism (e.g., *MAN*, July and August, '85), scale models require faster control (scale factoring of time), and the rate gyro facilitates this. Although it helps a pilot stay ahead of his model by minimizing abrupt upsets; it shouldn't be mistaken for an automatic pilot.

Given the need for safety on the flight line and when flying near spectators, we should all understand better our skills and limitations with regard to scale control features. No one wants to run over the deadline or force the judges to bail out of their chairs!

Gyros can be particularly helpful with multi-engine models. With these, an engine failure can result in asymmetrical thrust and loss of control before the pilot realizes what has happened.



Airtronics and JMW gyros are shown here. The Airtronics version has one more wire hookup but is more flexible because it can be applied to any of several control surfaces. The JMW was designed for helicopter use and best suits a rudder installation.*

PHOTOS BY FRANK TIANO

CONTEST USE

The legitimacy of using gyros in scale competition hasn't yet been officially questioned, although the AMA is presently considering new rule proposals. Rate gyros should be allowed for rudder control because they increase safety. Liability implications may also become a factor. The option should be left to pilots, because they know their planes best. Gyro use would probably increase the variety of scale models that can compete successfully, safely and within "scale runway widths" (e.g., 8 to 15 feet).

(Continued on page 116)

British Nats

by BILL DARKOW

PHOTOS BY BILL DARKOW

Left: ■ *Bryan Taylor's Hawker Typhoon.*

Far left: ■ *With his father, Richard "Dick" Wilson, calling the turns for him, 13-year-old Michael Wilson flew some good Club 20 races.*

Roger Winsor's Kilowatt 9.

Arthur Houghton and his scratch-built Lancaster, which has four O.S. .20s, retracts bomb-bay doors and full flaps. The model spans 90 inches and is 5 feet long.

Europe's largest aeromodeling contest

IF YOU LONG for a more relaxed competition that leaves you feeling good about having done your best whether you won or not, give the British Nationals a try. Europe's largest aeromodeling contest, the 1990 R/C and U/C British Nationals was held at RAF Barkston Heath and RAF Cranwell airfields on August 25 to 27.

Managed by eight-time British National Champion Ray Brotherston, the British International Pattern team of Graham Briggs, Andy Nicholls, Ken Binks and Richard Hirst flew their new designs in preparation for the European Championships.

The British International Team (left to right): Graham Briggs, Team Manager Ray Brotherston, Andy Nicholls, Ken Binks and Richard Hirst.

They all use Futaba 1024a radios. Ken Binks' Stylist has a Solarfilm-covered, 860-square-inch, built-up, Magnalite balsa wing structure using laminated carbon-fiber spars. Weighing 7 3/4 pounds and powered by a "pumped" Futaba YS Long Stroke .61 swinging an Isano 12x11 1/4 DN prop at 10,000rpm, the plane flew smoothly. The epoxy-glass fuselage is finished with a 1.5mil polystyrene laminate topped by a very thin gelcoat. To help trimming, the wing and the stabilizer have variable incidence.

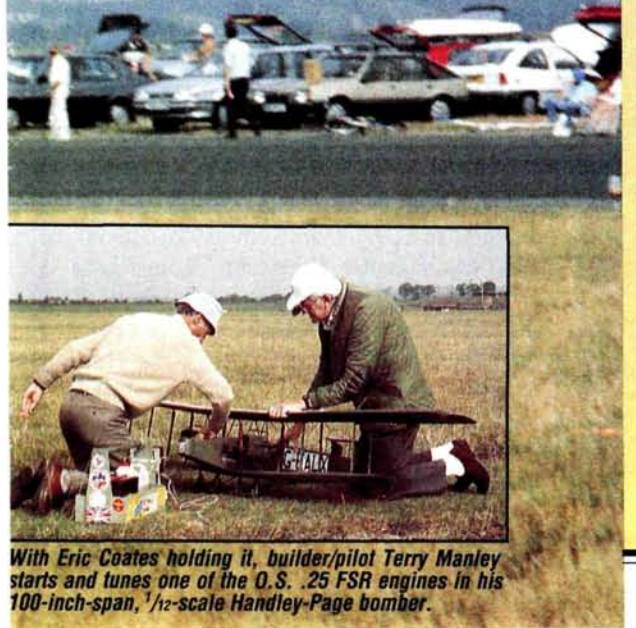
Andy Nicholls' Illusion uses an obechi-covered Styrofoam wing and tail assembly that's finished with Solarfilm, and the balsa fuselage is finished with K&B paint. The plane is powered by a rubber-mounted, O.S., "Hanno Special" .61 to reduce noise; it has an APC 12x12 prop and an O.S. pipe.

THE CONTESTS

• **R/C Scale,** which featured a knowledgeable and articulate flight narrator, was a spectator favorite, and each flight drew appreciative applause. The contenders included several current and former national and world championship title holders. Mick Reeves (the only person to win World Championships in U-Control and R/C) presented his magnificent 1/4-scale Sopwith Camel. Seven-time British National Champ and International runner-up Peter McDermott flew the only Army version of a Sopwith Triplane. The "Tripe" and Bryan Taylor's fine Hawker Typhoon were flown at the 1990 World Championships in Poland.

• **Club 20 Pylon Racing** planes used standard, unmodified, front-induction, side-exhaust, muffled .20ci engines with a usual prop size of 7x6. Fuel containing 5 percent nitromethane was given out at the contest. Three models were hand-launched and raced 10 laps around an 880-foot triangular course (approximately 1 2/3 miles). Barrie Lever holds the record at 63.9 seconds.

• **Sport 40** is similar to Club 20, but the engines are .40ci and equipped with throttles. The fuel is the same, and the props range from 9x6 to 10x6. Models had to ROG and race 10, 400-meter laps—a feat they usually managed in less than 2 minutes.



With Eric Coates holding it, builder/pilot Terry Manley starts and tunes one of the O.S. .25 FSR engines in his 100-inch-span, 1/12-scale Handley-Page bomber.

British Nats

Above top to bottom: ■ *The cockpit detail of Peter McDermott's triplane. The full-size thing should look so good—or is this a museum shot? Only the grass gives it away. A propeller-driven pump supplied fuel pressure when the pilot was too busy to use the "wobble pump."* ■ *Mick Reeves presents his 1/4-scale Sopwith Camel for static judging.* ■ *Philip Goldsmith getting a 1948-vintage Super Sunbug away in the 10-minute Timed Target event.*

• **FAI-F3D (International Class)** is the ultimate in Pylon Racing. Engine tuning was permitted; props were carbon fiber/epoxy resin $7^3/4x6^3/4$ turning at over 24,000rpm; and fuel was an 80:20 methanol/castor oil mixture. The races were the same as in Sport 40, and Barry Lever holds the British record of 76 seconds.

The R/C Silent Flight event was held at RAF Cranwell (the British equivalent of the U.S. Air Force Academy), and a design by Roy Yeabsley—a 10-foot-span, 1948 vintage "Super Sunbug"—immediately attracted this old-timer's attention. This former winner of the British Nationals looked like an ungainly dinosaur among the sleek, modern designs, but thanks to the launching and piloting skills of Philip and John Goldsmith, it flew with the best of them in the 10-minute Time Target event.

Roger Winsor (1988 member of the British team) flew his own design—the "Kilowatt 9." It uses a Demon Yokomo car motor with seven Sanyo 1800 SCR cells. Roger's teammate, Mike Proctor, flew a much-modified version called the "Transformer."

You should see (and hear!) what the Brits do with diesels! I was on the receiving end of much nudging, during which I heard comments like, "Bet you've never seen a diesel fly like *that* before," and, "Hard to believe that's a diesel, eh?" I also heard reminders to, "Be sure to tell the Yanks about our diesels."

• **In U-Control,** Team Racing was most popular and, with its announcer, it was another big crowd-pleaser that drew applause for the crews' efforts. Like frantic insects, shrill combat models performed their deadly dances of attack and evasion, and the winners' pit stops were incredibly smooth and quick—those diesels again!

Midget Speed with 1.5cc (.09) diesels on 35-foot lines, was a fascinating event, and Stunt/Precision Aerobatic models cut graceful patterns in their circles.

During WW II, Britain was saved by men and airplanes whose exploits are legendary, and 1990 marked the 50th anniversary of the Battle of Britain. There was a lot of pride and some misty eyes when all model flying was stopped and a Lancaster bomber, escorted by a Spitfire and a Hurricane, rumbled over the field and disappeared over the horizon—a fitting climax to the 1990 British Nationals and a fitting tribute to those brave airmen. ■

Mild

CONSTRUCTION

.40 Wild thing

by TOM STRYKER

I DESIGNED the Wild Thing .40 because I wanted a powerful, highly maneuverable ship that I could use at fun flys. To incorporate all the fun-fly requirements in one design, I would need a relatively short span for fast rolls, a wide chord for plenty of wing area, and a unique airfoil that would be practically stall-proof. Other considerations included the need for a long fuselage and a large tail for stability, sizable control surfaces for tight maneuvers, and a tall, stout landing gear for quick touch-and-go's.

After flying the prototype, I knew the Wild Thing would do well at fun flys. When investigating the other end of the aircraft's "envelope," I discovered the most surprising characteristic—one that has endeared it to everyone who has flown it. It flies extremely well at a slow speed, and it practically hovers in a slight breeze. Stalls are very soft,

or Wild?

and it shows no tendency to drop a wing. Many who have seen or flown the Wild Thing now want one as a sport flier.

MAKING THE FUSELAGE

After cutting out the fuselage sides, add the 1/8-inch balsa stringers and 1/8x1/4-inch spruce bottom stringers. Attach the 1/8x3/8-inch vertical stiffeners and rear fuselage doublers. Add the 1/16-inch, cross-grain doubler and trim out the wing slot. Cut out the firewall and the front bulkhead, and assemble the rear bulkhead.

PHOTOS BY TOM STRYKER

SPECIFICATIONS

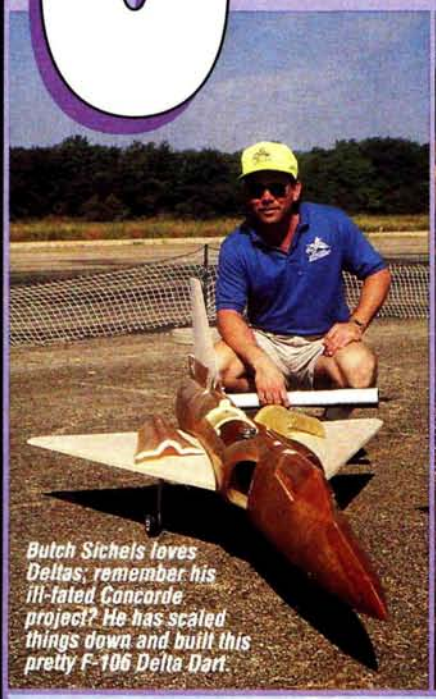
Type: Sport fun fly
Wingspan: 48 inches
Wing Area: 600 square inches
Wing Loading: 15 to 19 ounces/square foot
Length: 44.25 inches
Weight: 4 to 5 pounds
Power Req'd: .35 to .45 2-stroke engine

JET BLAST SPECIAL

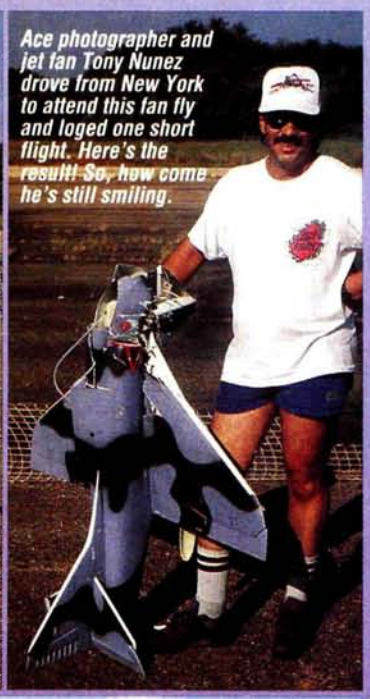
8TH ANNUAL SOUTHWEST FAN FLY

by RICH URAVITCH

WHAT DO YOU get when 101 jet modelers with 134 airplanes gather under a beautiful Texas sky at a flying site that's ideally suited to ducted-fan R/C operations?—the 8th Annual Greater Southwest Fan Fly, which is considered by many fan fans to be the "granddaddy" of all fan events. It's a well-deserved title, since the event has been around for longer than any similar gathering that focuses on ducted-fan jet models. The pressures of competitive scoring are absent, and the fun-fly environment helps to build attendance and participation. There's plenty of great flying and the opportunity to check out new products and new jet designs. The Mid-Cities R/C Club of the Dallas/Fort Worth area hosted the event, and CD Dawn Buckley did a terrific job. Once again, Lynn McCauley arranged for the use of the site through Copeland Ministries, the expansive domain of TV evangelist, Kenneth Copeland.



Butch Sichels loves Deltas; remember his ill-fated Concorde project? He has scaled things down and built this pretty F-106 Delta Dart.



Ace photographer and jet fan Tony Nunez drove from New York to attend this fan fly and loged one short flight. Here's the result! So, how come he's still smiling.

REMINISCING

Like many others, I've attended all eight SW Fan Flys, and it has become a natural part of "hangar flying" to start sentences with, "Remember when" and to reflect on how far ducted fans have come. Remember when:

- the Turbax-1 was the *only* fan you could buy?

Lynn McCauley's Convair B-58 Hustler! Lynn solved the complicated landing-gear problem first, then he built the airframe around it. It uses four Kress RK 740 fan units.

Two of the Bob Violett Models F-16C Fighting Falcons. The BVM kits and fan units probably represent the highest level of engineering sophistication available.

Eight years of ducted-fan

■ *Not flown, but certainly an attention-getter, this F-117A Stealth "fighter" was designed and built by Dave Hudson. Twin fans provide the thrust for this unique machine.*

■ *The flight line early in the morning. No time lost here—activity started at 8 a.m.*

■ *Col. Bob Thacker's newest—the Ryan X-13 Vertijet. The full-scale version was intended for VTOL operation, and the Colonel is pursuing that objective with his model. It flies well in the conventional mode, and it has an unusual fan sound.*

Father-and-son team Ivan and Paul Munninghoff brought a pair of their scratch-built Convair F-102 Delta Daggers. When they had solved their engine problems, radio maladies set in, and only skillful flying could bring the bird home. This design has lots of potential.

progress—what's next??

■ *Left: Tom Sewell's T-33 "T-Bird." Scratch-built, it shatters some earlier beliefs about thrust-to-weight ratio requirements—18 pounds flown by a single O.S. .91/Dynamax package; scale-sized inlets and tail pipe! Congratulations Tom!*

■ *Tom Cook explains the ruggedness of his retract units to Bobby Zeiger, while Bob King and Mark Wornell absorb the info. There's always a lot to learn at these fan flys.*

- R/C Kits Mfg. produced an F-100 with the fan hanging out of the bottom, and no one you knew had ever seen one fly?
- 40-percent nitro was the norm?
- two flights on a glow plug were a gift?
- D&B Models produced an F-86 and a T-2J Buckeye?
- engine destruction threshold was 19,500, and you needed 19,600?
- good glass work was judged by the amount of gelcoat used, regardless of weight?
- you received blank stares when you mentioned inlet sizing, duct losses, swept-blade area and exhaust velocity?
- you said ducted-fan airplanes would eventually exceed 200mph?
- you said there would ultimately be ducted-fan airplanes that any sport flier could easily build and comfortably fly?

So much for reminiscing. Modelers involved with ducted fans are an enthusiastic, creative group who generate an energy that makes events like these exciting. The essence of the SWFF can be captured with the phrase, "the big, the fast and the unique."

IN THE LAND OF THE GIANTS

Among the "big" was Ralph Braun's beautiful Cessna Citation that was powered by a pair of O.S. 65s driving Dynamax fans. Dennis Crooks flew this scratch-built, one-off model throughout the weekend, and he impressed everyone with its smooth and seemingly docile flying

THE SPELL IS BROKEN, THE JINX IS OFF, THE HEX LIFTED!

I used to have a rule about flying other modeler's airplanes. The rule was very simple: I didn't! Now, where I come from, if you "shoot another guy down" by turning on your radio while he's flying, you replace the airplane, pay for the radio repairs and do whatever it takes to cover his losses. Do the same rules apply, however, when you crash someone's airplane while you're flying it?—a tough call! Either this person was at least one quart low when he made the offer, or he must have thought you were qualified.

Three years ago at the SWFF, I crashed my own JHH F-86 in front of the world, not to mention Tom Cook, Bob Violett and the entire Austin contingent. This unfortunate act provided enough visual evidence for anyone to question my previously untarnished credentials. Two years later, Mike Kulczyk (part of that Austin contingent), either through a memory lapse or compassion, offered me a crack at his almost brand-new BD-10, which I promptly screwed into the ground at something decidedly in excess of normal approach speed. I thought that this repeat performance would solidify the impression previously created and dispel any doubt that the only mechanical devices that should be allowed in my hands are a camera, or a computer keyboard—but never a transmitter!

Apparently, the Austin contingent has unbounded faith, because at this year's get-together, I was offered a chance to fly one of the nicest jets on the field—Tom Sewell's large scale T-33. At first, I declined, but after some additional prodding from, of all people, Mike Kulczyk, I accepted. I didn't crash, bend or break the T-Bird, so I guess the curse is broken. The airplane is a delight to fly, and now that the spell is broken, I'll accept anyone's offer to fly an airplane. I figure if it's offered, the owner knows what he's doing. Thanks, Tom, for the bright new outlook, and to the rest of you—keep those offers coming!

qualities. He also flew two large models of his own: the absolutely awesome F-14A Tomcat and the SR-71 Blackbird that were both built from Yellow Aircraft kits. The crowd's reaction to the Tomcat swinging its wings during knife-edge flight was always one of amazement.

Another model that represented a breakthrough of sorts was the beautiful Lockheed T-33 that was designed and built by Tom Sewell. This 18-pounder featured built-up balsa-and-foam construction; it spanned more than 80 inches, and it was powered by a single Jet Model Products Dynamax fan unit driven by an O.S. .91. With scale inlets and exhaust nozzles, the T-Bird opens a new chapter in the ducted-fan book and rewrites some old ones.

Tom let me fly this beauty, (much to the amazement of Mike Kulczyk, whose BD-10 I "re-kitted" at last year's SWFF). After flying it through a variety of maneuvers, I nominated this T-33 for the "Gentle Jet of the Year Award." It's smooth, very predictable and extremely scale-like in both appearance and flight. Tom thinks it can be built lighter, and he was later overheard saying something about "a 5-pound canopy..."

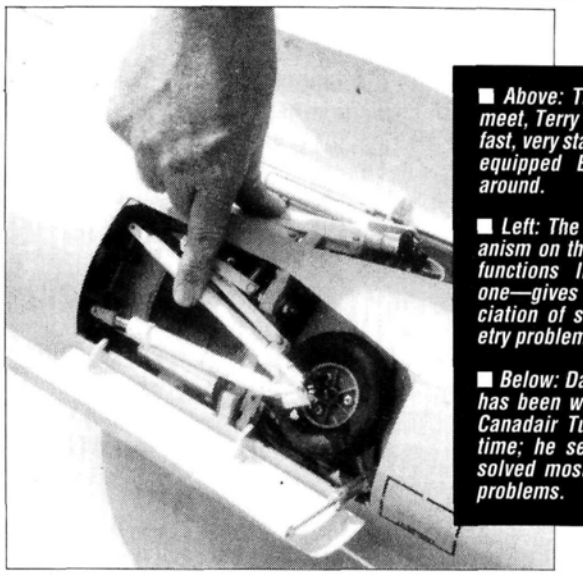
What's this FAN FLY all about? The big, the fast and the unique!

A number of jets (most of them Bob Violett Models) were also in the "fast" category. There's no denying it—the production BVM stuff outperforms everything out there, in both horizontal and vertical planes. Bob's sport jets, e.g., the Sport Shark, the Aggressor and the Viper, deliver blistering high-speed performance, and for those who feel the need for speed, they're the answer. Even his scale kits, e.g., the F-86 and the new F-16C, qualify as better than average in the Mach department. With all this performance built into his products, Bob should wear a name tag that identifies him as the "Rapid Transit Authority."

UNIQUE CRITIQUE

The "unique" category?—how about a twin, Byrojet Lockheed F-117A, designed and scratch-built by Dave Hudson. This attention-getter, however, wasn't quite ready for its test hop. Dave mentioned that he was concerned about the size and shape of the exhaust nozzles, which are slit-like rectangles similar to a configuration that's used on the full-size plane. To make sure that this project was worth pursuing, he mocked-up the exhaust system and took some readings with the engines running. To his surprise, the loss was negligible and sufficient thrust remained to fly the plane adequately. He'll provide me with follow-up information after he has flown it.

Another twin, decidedly smaller and overlooked because of it, was Val Ure's AVRO (Canada) CF-100. Val, who hails from the great white North, came to Texas with



■ *Above: Throughout the meet, Terry Wysong's very fast, very stable Dynamax-equipped BD-5J buzzed around.*

■ *Left: The retract mechanism on the Violett F-16 functions like the real one—gives a real appreciation of solving geometry problems.*

■ *Below: Dave Thompson has been working on his Canadair Tutor for some time; he seems to have solved most of the early problems.*

scale ace Gerry Fingler. He used a pair of RK-20 fan units on his model, which was driven by HB .21 Grand Prix engines and sounded great on the flybys. Unfortunately, one of them signed off, and the little AVRO spun itself into the ground. The damage was repairable, but not over the weekend, so Val signed on as Gerry's one-man pit crew for the duration of the Fan Fly.

TWO STALWARTS

Two guys who have been involved with this meet since day one are Lynn McCauley and Butch Sichels. I don't think either has ever built a jet kit; each prefers, instead, the challenges of designing and scratch-building. Their earlier efforts include Lynn's F-84F Thunderstreak and F-104 Starfighter, as well as various "experiments" and shelved projects, e.g., an F-111.

Butch is best known for his long-term commitment to a four-engine Concorde, which, in full view of a television audience, went rocketing down the runway, reached velocity and went vertical. Unfortunately, drag and lack of air speed overtook its rate of climb, and the huge bird settled, in a decidedly undignified fashion, on its tail cone and cluttered the tarmac with huge Styrofoam chunks.

Undaunted by this minor setback, Butch decided to build something easier with a delta wing and a single engine. An F-106 Delta Dart was the result. He showed the nearly complete airframe at the meet, and it looked great. He decided to invite the media *after* the test flight—wise move, Butch.

Aeroloft Designs' John Wagner with his Yellow Aircraft F-4E Phantom shows off markings produced by Aeroloft. It sure beats cutting stencils and hand-painting.

Lynn must have received a huge dose of inspiration from Butch, because he also brought his newest—an almost completed, B-58 Hustler, which will be powered by quad RK-740 fan units. Like Butch, Lynn carved a plug and laid up the fiberglass fuselage and nacelles. The landing gear is a work of art, and it duplicates the original almost exactly.

Never one for conventional subjects, Col. Bob Thacker brought his new Ryan X-13 Vertijet O.S. .91 with Hurricane fan; no VTOL yet, but he's closing in on it!

Throughout the weekend, I occasionally heard an unusual sound: more whistle than shrill screech; more air moving than engine noise. Looking up, it always turned out to be the Ryan X-13 Vertijet under the guidance of Col. Bob Thacker. The Colonel has always been one for unusual projects and his X-13 certainly qualifies. The full-scale version was originally built by Ryan as a vertical takeoff and landing (VTOL) test vehicle, and it actually did land (or at least attach itself to a vertical platform) vertically. The films I've seen indicate that this was, at the very least, a sporty adventure.

"Stellar Star"—an A-4 Skyhawk, built from a Yellow Aircraft kit, with an airbrushed sport finish (nice paint job).

The Colonel's R/C version is now operated only in the conventional takeoff and landing mode, but he did show me his "bread-boarded" control system, which he hopes will allow him to duplicate the VTOL properties of the full-size X-13. Unlike the BAe/McDonnell Douglas Harrier, the X-13 didn't use thrust vectoring to make the transition from vertical to horizontal flight; it used air speed and control deflection to effect the change in attitude. If anyone can sort out the details required for the model form, I'm sure the Colonel can!

This year's SWFF was the best yet. The mainstream modelers (by far the majority) flew a variety of popular sport jets, e.g., Parkinson Regal Eagles, Byron F-16s, Century Jet Sport Hawks, Yellow Aircraft A-4s and Violett Aggressors. These still form the backbone of ducted-fan activity, and they're seen in greater numbers than ever before. Compare today's availability to that of eight years ago!

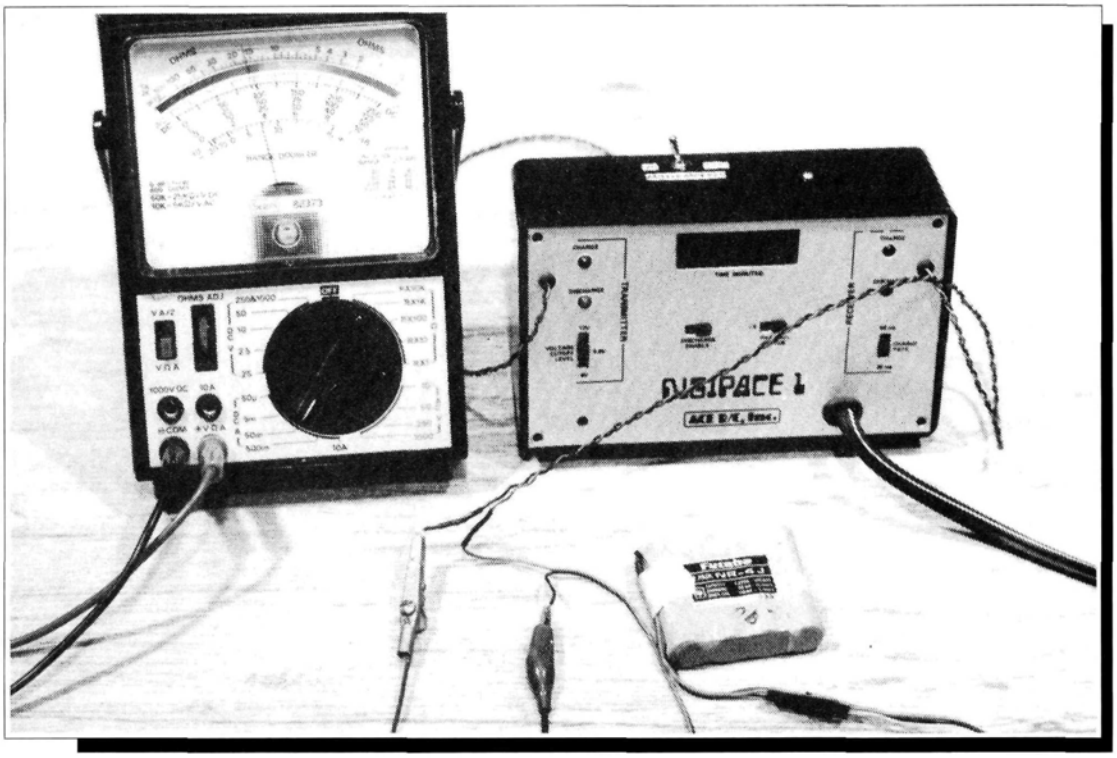
Here are a few questions you might want to re-read in 1999. Remember when:

- we only had nine fan units to choose from?
- you could actually buy a jet kit, fan and engine for less than $700?
- the only engines available were single-cylinder and glow-fuel fed?
- we never thought of using a portion of the airframe to muffle the engine?
- we had to pump air for the retracts into a storage tank before each flight?
- the best that Violett could do was a mere 210mph?
- Uravitch flew at the Southwest Fan Fly and didn't crash an airplane?

The 1991 SWFF schedule will appear in "Jet Blast" as soon as the dates are available. Hope to see you next September in the Dallas/Fort Worth area! For peak performance, stay tuned! ■

INCREASE THE VERSATILITY OF THE ACE DIGIPACE

by BILL HAYWOOD



PHOTOS BY BILL HAYWOOD

Here, the ammeter shows a reading of approximately 20mA. The front panel switch is in the down position, and the newly installed switch is set to the 20mA charge rate.

THE DIGIPACE by Ace R/C* is limited to servicing two sizes of receiver battery packs. The 50mA rate for a 500mA pack is usually provided as standard, and you can choose one other receiver charge rate—either 20mA or 120mA. The Digipace provides three charge rates for the transmitter. The ability to switch to three receiver charge rates is very desirable, especially for those who fly 1/4 scale and the .049 variety of R/C aircraft.

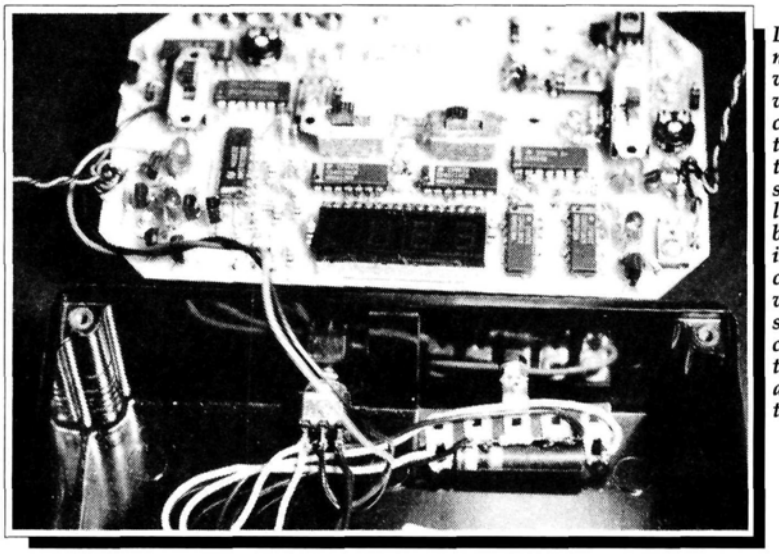
The Digipace is designed so that changing the value and wattage of one resistor on the circuit board will change the receiver battery charge rate. To switch quickly from a 20mA to a 120mA charge rate, it's only necessary to provide the ability to switch from one of the resistors to the other. This is an easy process, and the parts should cost no more than $10.

MOD PROCEDURES

First, study the instructions that come with the Digipace. Remove the four screws from the front corners of the instrument, and remove the circuit board from the plastic cabinet. (Set the cabinet aside.) One screw remains on the metal faceplate to secure it to the circuit board. It's on the bottom left side, directly below the transmitter selector switch. Remove this screw and nut, and slide the rubber grommets in the faceplate over the AC power cord and the two charging wires. Don't disconnect the wires or remove the faceplate from the cord.

Remove resistor R14 from the circuit board (R14 is located on top of the circuit board near the right end). It can be found on the right of and parallel to receiver charge-selector switch S2. Carefully remove the resistor lead near transistor Q5. This lead is soldered onto both the top and bottom of the circuit board. Insert the ends of two 6-inch lengths of no. 22 stranded hook-up wire into the circuit board where the resistor leads were removed, and then solder them. The wire near Q5 must be soldered on both sides of the board, front and back. The other wire is soldered onto the back only. Connect the opposite end of one of the two wires to a center pin of the new double-pole/double-throw switch, and

AN EASY, SAFE WAY TO ADD A THIRD RECEIVER BATTERY CHARGE RATE



Left: The 6-inch no. 22 black and white stranded wires run from the circuit board to the two center terminals of the switch. The five-lug tie post has been mounted inside the black case. Extra-long wires allow all soldering to be completed before the components are fastened inside the case.

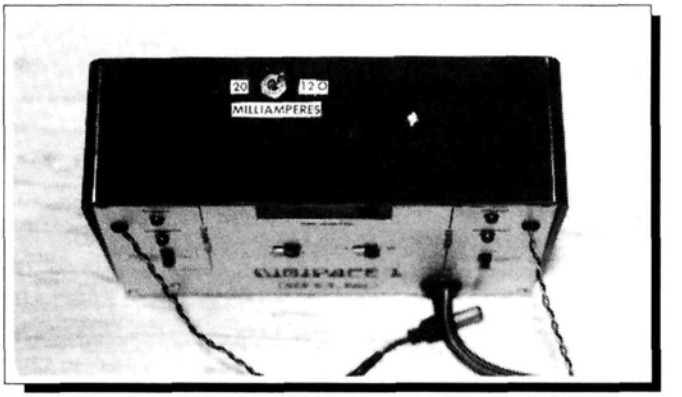
then solder. Connect the second wire to the switch's other center pin and solder it. This leaves the four end pins on the switch without wires.

Solder the larger, 68-ohm, 2W resistor (blue, gray, black) to the two outer lugs on the five-lug tie post. Solder the 820-ohm, 1/2W resistor (gray, red, brown) to the two inner lugs, and leave the center lug unused. Cut four, 6-inch lengths of no. 22 wire. Solder one piece to each of the four lugs where the resistor leads were just soldered. Solder the two leads from the 820-ohm resistor to the two pins on one end of the DPDT switch. Solder the remaining two leads from the other resistor to the last two pins on the opposite end of the switch. This completes the wiring.

Drill two holes in the plastic cabinet top for mounting the switch and tie post. Choose a location that will clear the back of the cabinet and the back of the circuit board. Mount the switch and the five-lug tie post. Inspect all solder joints and all wiring for errors. Check the switch for good solder joints and for shorts between pins. With an ohmmeter, check the circuit board, top and bottom, for good connections. Slide the faceplate along the wires to its original position, close to the circuit board. Carefully replace the small screw and nut, and secure the faceplate to the circuit board. Reinstall the circuit board and faceplate in the case, and insert and tighten the four bolts that secure the faceplate to the case. This completes the conversion.

MATERIALS

No.	Item	Radio Shack No.
1	DP DT sub-miniature toggle switch	275-614
1	5-lug tie post	274-688
1	3-color no. 22 stranded hook-up wire. (3 spools)	271-130
1	Available at most electronics specialty stores: 820-ohm, 1/2W resistor	
1	68-ohm, 2W resistor	



Labels identify charge-rate switch positions. This switch is inoperative when the Digipace receiver charge-rate switch is in the 50mA position. Slide that switch down, and the new switch shown here is used to select the two remaining charge rates.

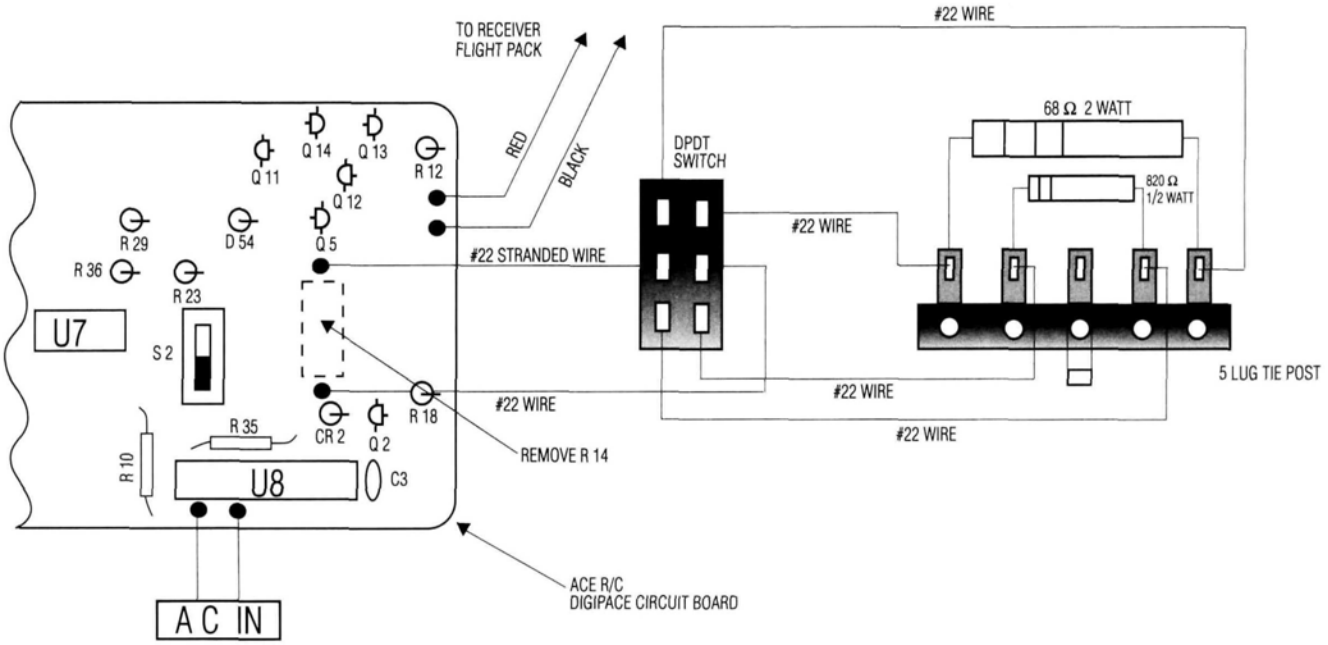
CHECKING CHARGE RATES

To identify switch-position charge rates, check the modified Digipace's operation with an ammeter. To check charge rates, cut one lead of the Digipace receiver charging wires, and remove the insulation from the ends. Connect a standard 500mA receiver battery to the Digipace. Place the ammeter leads in series with the Digipace charging wire, which was cut for this test. Before connecting to AC power, be sure to set your meter to the 500mA scale, and slide the Digipace receiver switch up to the 50mA position. This will prevent a meter burnout if a mistake has been made in the wiring.

At this point, the Digipace can be plugged into the 115V AC wall outlet. Make sure that the meter doesn't swing off scale. If it does, disconnect the AC power immediately! Switch the meter or the leads, as necessary, and reconnect to

(Continued on page 60)

DIGIPACE CONVERSION CIRCUIT



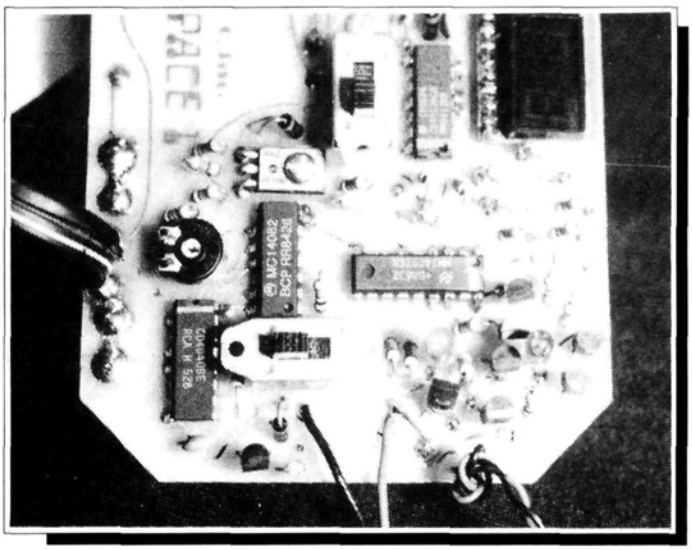
(Continued from page 59)

the AC power. The charge rate should read 50mA. If the operation is correct, push down the receiver-selector switch on the face of the Digipace. In the down position, this switch automatically transfers control of the charge rate to the new two-way switch. One switch position will be for 20mA, and the other will switch in the 120mA current flow. (Your meter will tell you which position it's in.) Label the positions on the new rate switch, which is on top of the Digipace.

To check the discharge rate of your Digipace, be certain to disconnect the AC power and reverse the ammeter leads. (The current will change direction during the discharge cycle.) Now, connect the Digipace to AC power, and push the discharge-enable switch. Ace R/C gives a discharge rate of 300mA, plus or minus 5mA. The meter used in the original modification measured 285mA, which is close enough. Don't be surprised if you get the same reading in all switch positions; the discharge rate is always the same. Disconnect the test setup and reconnect the wire you previously cut for testing.

If you have problems, go back and check all solder joints, especially the wire near Q5, where both the front and back of the board must be soldered. Also, check the switch pins to be sure there are no solder bridges between them.

If you don't have all the parts for this modification (see materials list), Radio Shack stocks most of what you'll need (except the 68-ohm, 2W and the 820-ohm, 1/2W resistors, which can be obtained from your local electronics specialty store). The modified Digipace has been used many times. It has proven so reliable that if I buy another, I'll convert it. With a minimum of effort, the Digipace receiver cycling capability has been increased a giant 33 percent!



Right: Receiver charge-selector switch (near the bottom of the photo) is just above the black and white wires that have been soldered into two holes left when the R14 resistor was removed. The twisted wires at bottom right are Digipace receiver battery wires.

**Here's the address of the company featured in this article:*
***Ace R/C, Inc.**, 116 W. 19 St., Box 511C, Higginsville, MO 64037.* ■

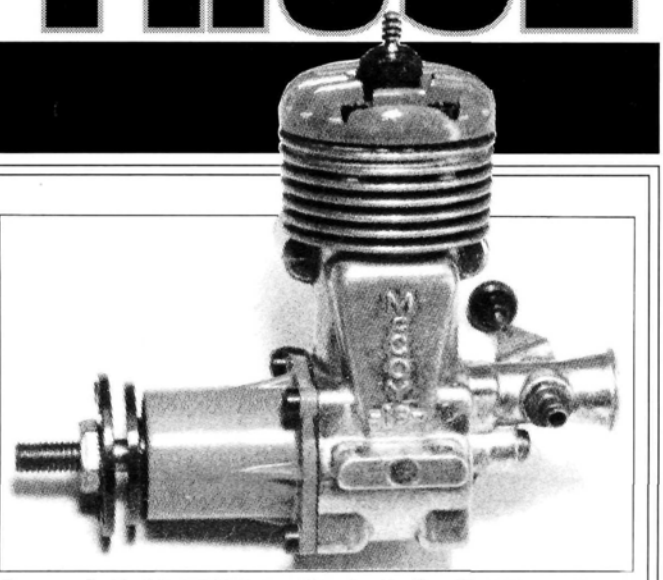
ABOUT THOSE ENGINES

by JOE WAGNER

Reworks, spark plugs and "degumming" engines

Today's model airplane engines are competently designed and well made, and practically all of them, from the smallest 1/2A to the biggest "quarter-scale" engine, perform reliably. You wouldn't think modelers would expect much more from their engines, yet many of us *do* (i.e., higher rpm, lower idle speed, less vibration).

Ever since model engines were first introduced, power fliers have "customized" them. Hoping to improve performance, they alter the timing, "port and polish," change the compression, lighten the pistons and drill out the venturis. Unfortunately, most of these "hop-ups" do more harm than good. The designers and manufacturers of today's miniature engines are skillful and experienced, so it's difficult to improve on their work!



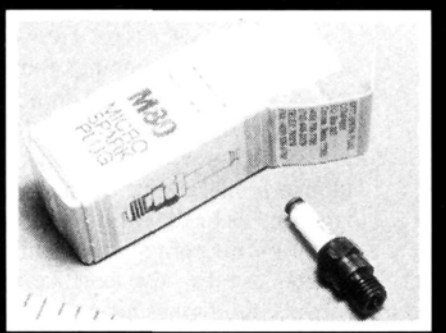
George rebuilt this 1950 McCoy "Racing Redhead" .19 for use in one of my old-timer projects. Its output is amazing, yet it starts as easily as a Cox Babe Bee.

Still, it *can* be done, though not by the average modeler. To increase the output of today's highly-developed engines, you need someone who has even more skill, ingenuity and experience than the manufacturer. Although people with such qualifications aren't easy to find, George Aldrich* is one of them.

George has been in the engine-rework game for over 40 years. His innova-

(Continued on page 62)

Plug Problems



Stitt's M80 miniature spark plug has recently been improved for better resistance to carbon build-up.

We all know—too well!—about spark-plug burn-outs. Now that model engines with spark ignitions have made somewhat of a comeback, a few modelers have had the plugs in them fail. No, the spark plugs don't burn out; the problem seems to be caused by carbon build-up on the center electrode insulator. The carbon short-circuits the spark gap and puts the engine out of action.

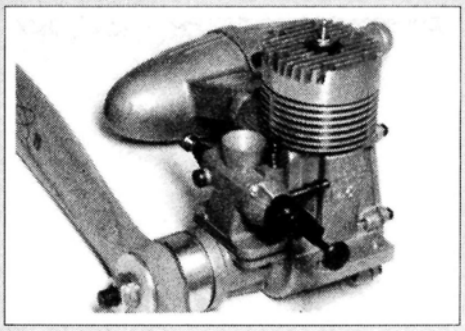
Many spark-ignition fliers use alcohol-based fuels instead of gasoline, because they allow the engine to run much more cooly than it would using gas. Although such fuels help to prevent engine wear, they aren't as good for the plugs, because a hot-running engine burns away the sooty deposits on its plug electrodes.

ARGO-USA's* John Targos is familiar with this situation because he's a major supplier of the best 1/4-32 spark plug on the market: the Stitt M80. Early versions of this plug were particularly troublesome to Ohlsson-23 owners in Denver, CO. (Ohlssons are cool-running engines; it's hard to say whether Denver's mile-high altitude also contributed to the problem.) In 1989, Stitt redesigned the M80's electrode so that its temperature would increase during running. Since then, carbon-fouling problems have seldom occurred. Of course, *some* plug contamination is inevitable, owing to the fact that model engines burn a mixture of fuel and oil. As we all know from automotive experience, spark plugs won't last forever, but the latest Stitt M80s will last a long time indeed.

Incidentally, ARGO-USA sells a number of hard-to-find power-model items, from antique diesel replicas to modern Czechoslovakian Modela CO_2 engines. (I have to build a small R/C airplane for one of those; they're neat!) ARGO also offers many spark-ignition components, including a clever, R/C, servo-operated, ignition-cutoff switch. Write to the company for the latest catalogue!

ABOUT THOSE ENGINES

Fox "Fix Up"



When new, this Fox .40 was gummed-up with residue from the castor-oil fuel that had been used in the factory test run. WD-40 saved the day; no force was required!

Fox* engines are test-run at the factory before they're packaged for shipment. When you buy a Fox you know it runs, and the initial needle/throttle settings have already been made! Occasionally, however, this test-running causes problems. Duke Fox uses castor-oil fuel in the test-runs, and castor will congeal if it's left in an engine. If you buy a Fox that has been in a dealer's showcase for a while, it will probably feel mighty stiff when you try to turn it over.

I bought a Fox that was so gummed up with hardened castor oil that even its throttle barrel wouldn't move! If the moving parts on a Fox (or any other engine) seem to be stuck together, don't force them! Instead, copiously spray WD-40 (or a similar penetrating oil/solvent) on and into the engine, and let it soak in (heating it with a hot-air gun will help). When the solvent has loosened everything, rinse out the gummy residue with more WD-40, and then blow-dry the engine and lubricate it with your favorite after-run oil. (I use 3-in-1; others recommend silicone "gun oil," Marvel Mystery Oil and even drug-store mineral oil.) You should also do the same thing at the end of every flying season!

My pal George Aldrich takes his engine customizing very seriously. Each one's performance has to be <u>great</u> before he's satisfied with it!

tions include several techniques that are now standard on high-power model engines (e.g., taper honing for ABC cylinders and controlled cracking of their internal chrome plating for improved lubricant retention.) His custom engines have won many contests and set impressive performance records.

When I last talked to George, he had recently expanded his engine customizing business. Now he can handle just about any 2-stroke model engine larger than 1/2A and smaller than a leaf-blower type. He works on antiques, racing engines and R/C engines, both foreign and domestic.

I've known George since 1950. For years, he wrote a popular column on model engines in this magazine, and he has a world-wide reputation for his competition achievements and for the performance records his engines have set. If you have a model engine—new or used—that you'd like to get more out of, don't risk reworking it yourself. Let George do it!

**Here are the addresses of the companies mentioned in this article:*
Aldrich Models, *12822 Tarrytown, San Antonio, TX 78233.*
ARGO-USA, *3229 Dianora Dr., Palos Verdes Peninsula, CA 90274.*
Fox Manufacturing Co., *5305 Towson Ave., Fort Smith, AR 72901.* ■

HOBBY DYNAMICS

Gobee 40

An intermediate trainer for hotter sport flying

by DAVE WINDOM

WHEN *MAN* EDITOR Tom Atwood told me he had an advanced trainer available for review, I jumped at the opportunity! I'm a local flight instructor, and lately, I've been working with five new students who own a variety of basic trainers. Some of them have mastered the basics and are looking for second airplanes. I usually have a variety of trainers available for my students to use while they're building their own, and I was eager to see what they thought of the Hobby Dynamics* Gobee 40.

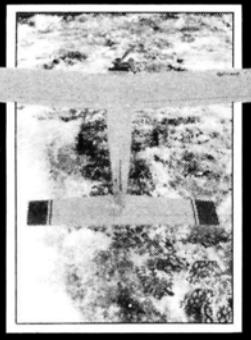
The Gobee 40 is a balsa-and-plywood intermediate trainer with a semisymmetrical wing that spans 62¼ inches. With an all-up weight of 4 to 5 pounds and a wing area of more than 680 inches, the Gobee has a very light wing loading and lots of dihedral—features that are very important to a student's success when making the transition from basic trainers to more advanced aircraft.

PHOTOS BY DAVE WINDOM & CLYDE KNECHT

THE KIT

The hardware pack includes most of the parts you'll need to complete the construction, including an assortment of snap links, wood screws and landing-gear components. You can cut the kit's Mylar strips to shorter lengths for hinges, but you'll have to provide some pushrod material.

The 23-page instruction book is well-written and includes a parts check list and good black-and-white photos. I did find an error in the building sequence (which I'll discuss later), but otherwise, first-time builders should have no problem following the instructions and framing up the Gobee in approximately



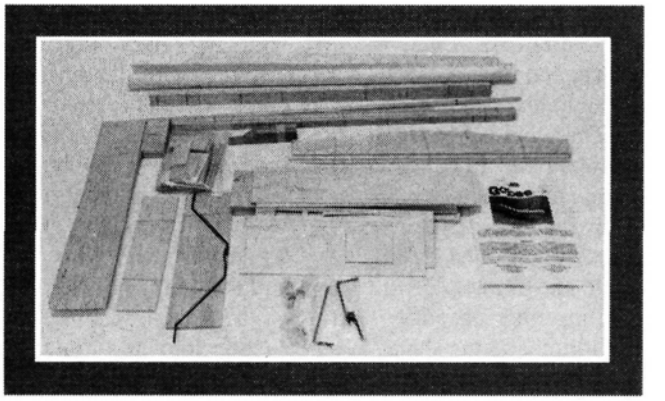
Gobee 40

SPECIFICATIONS

Type: Intermediate trainer
Wingspan: 62 1/4 inches
Wing Area: 682 square inches
Wing Loading: 16 ounces per square foot
Length: 45 inches
Weight: 4 1/2 to 5 pounds
Power Req'd: .40-size engine
No. of Channels Req'd: 4 (throttle, aileron, elevator, rudder)
Sug. Retail Price: $77.99
Features: the Gobee 40 has a semisymmetrical airfoil, a hardwood motor mount and torsion-bar landing gear. You can bolt on the wing mount or use rubber bands.
Comments: this kit is easy to build, and the die-cutting is very good, but the nose-gear mount needs reinforcement. The Gobee 40 is designed to bridge the gap between trainers and sport planes.

6 hours. (Add a few more hours for covering, and you've finished!)

The wood is of a good quality, although it's perhaps a little hard. The die-cutting is super; the balsa and plywood pieces punched out cleanly with absolutely no splitting or die-crunching. To simplify assembly, all the parts that are related to a particular sequence are rubber-banded together.



The contents of the kit's hardware bag. Notice the cleanly die-cut plywood.

BUILDING THE FUSE

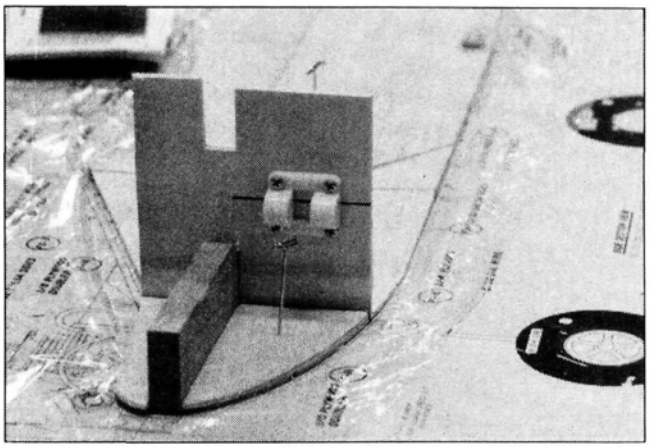
Begin by building up the fuselage sides from the die-cut sheets and marking the former locations. Then add the plywood nose doublers and hardwood engine bearers. Once these are in place, install former F-1 (the firewall).

On page 20 of the instructions (under the heading of "Final Assembly"), it tells you to drill pilot holes for the nose-gear bearing and install it, but by this time, the model's nose has already been sheeted.

The folks at Hobby Dynamics confirmed this error in the building sequence. The nose sheeting is really only cosmetic, so I recommend that you leave it off. To save yourself some headaches later, mount the nose-gear bearing and drill the pushrod hole *before* you put F-1 into the fuselage. It's easiest to assemble the whole nose-wheel group at one time and align everything accordingly.

When you've installed the firewall, the rest of the fuselage goes together quickly. Simply add the formers and the wing hold-down blocks, and then glue the diagonal bracing into the rear of the fuselage. Snap the fuselage sides together, and glue them into place over the plan's top view. Sheeting the top and bottom really increases the strength of the fuselage. Fuelproof the engine area, and it's ready for covering.

I only made one change to the stock Gobee: I put plywood supports in the fuselage floor to accommodate the later addition of floats. I'll probably add more vertical area to the tail section when I add the floats, and the stabilizer tips would look great with DeHavilland Beaver-type stabilizer vanes!



The firewall and nose-gear installation. I deviated slightly from the recommended construction sequence (see text).

TAIL SECTION AND WINGS

I completed the tail section while waiting for the polyurethane paint in the engine compartment to dry. The tail surfaces are of flat sheet stock, and there are only two glue joints in the vertical stabilizer and one in the horizontal stab. To get the

Gobee 40

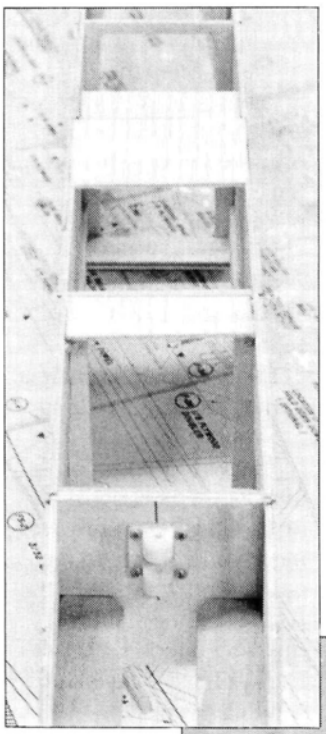
rest of the tail ready for covering, all you have to do is sand it. The horizontal stab and the elevator are both made of hard balsa, and they're very straight and flat.

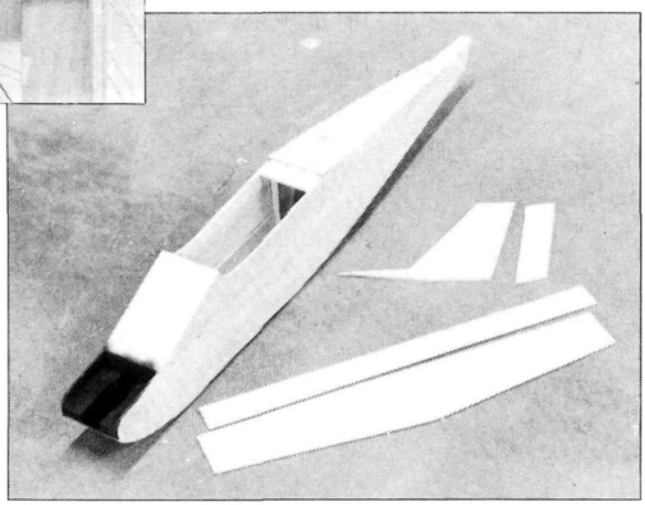
The wing is of the typical built-up construction, and both halves are shown on the plans. A hardwood-dowel leading edge and a notched trailing edge simplify building, and the shear webbing adds strength. I chose to bolt on the wing, although a couple of my students thought that the rubber-band method would be simpler.

The only problem I had with the wing involved the installation of the dihedral brace. The instructions call for the wing's center section to be built from a laminate of six sheets of 1/8-inch lite-ply. When the wings have been joined and the epoxy has thoroughly cured, you're supposed to cut through the center-section ribs from top to bottom—just behind the top and bottom spar—to make room for the dihedral brace. When I tried to do this, I broke out the entire center section (leaving the spars and leading and trailing edges behind), but I quickly shimmed things back into place.

It was at this point—with my hands full of epoxy—that an extremely large, irritated wasp flew into my hair. I managed to drag him out and toss him onto the workbench. Since his wings were covered with epoxy, I thought I could take my time finding something with which to squash him. The wasp escaped on foot, however, and I'm still picking epoxy out of my hair.

"Stout" is how I'd describe the completed wing. The balsa stock was so hard that I couldn't push pins through it except at very oblique angles. The spruce and balsa spars and trailing-edge stock have notches that make alignment simple and the structure strong. Both panels went together quickly; it took only 2 hours to get to the stage where they're joined with epoxy. It took me another half an hour to sheet the center section and drill the wing hold-downs, and the Gobee's frame was completed.





I added two plywood plates to the fuse bottom to act as hard points for mounting floats.

Here, the completed fuselage and tail group are ready for final-sanding and covering.

EQUIPMENT INSTALLATION

So that adjustments can be made easily, I prefer to install my flight gear before covering. The fuselage has plenty of room to accommodate any standard radio system. If the CG needs changing after the model has been covered, you can adjust it by moving the receiver battery pack. After installing the radio and engine, I checked all the controls for ease of movement and then removed the gear to prep the Gobee for covering.

I used Aero Span heat-shrink covering from Balsa USA*. It's economical, it works with low heat and it covers as well as other coverings I've used. To add the trim colors, I used polyurethane spray paint.

For power, I decided to use the same type of engine that my students typically use in their first airplanes, so I dug out an old K&B* .40 that I once used in the slow pylon-racing class. (Any .40-size engine will provide more than enough power.) The engine had been in storage for several seasons, so before bolting it into the plane's nose, I flushed out the transmission oil that I had used as a preservative.

FLIGHT REPORT

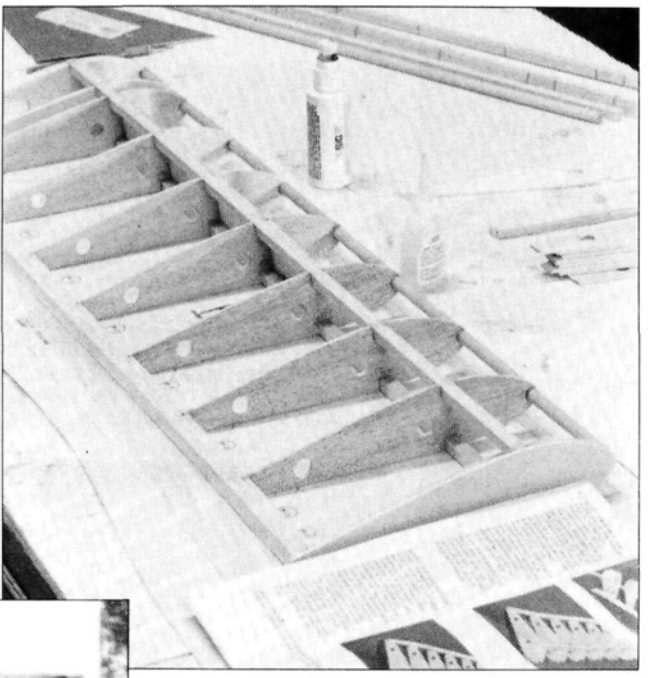
The Gobee's first flight was somewhat disappointing. After several taxi tests, I lined it up with the wind and advanced the throttle. Shortly after takeoff, the engine flamed out because of an overly lean setting. I made a straight-ahead landing into a patch of sabertooth knapweed, and this caused the nose-gear bearing to tear off the firewall. Back to the shop!

I replaced the nose-gear bearing and beefed up the lite-ply firewall with 1/8-

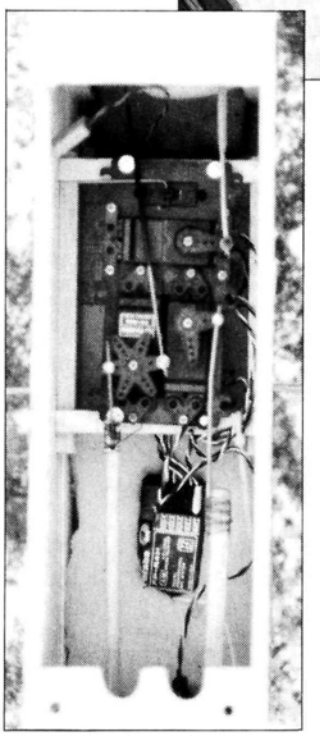
inch birch ply. With several inches of fresh snow on the ground, I packed up the Gobee and returned to the flying field.

I headed the Gobee down the runway and advanced the throttle, but the snow created too much drag on the small wheels and refused to let the plane rotate. With a hand-launch, the Gobee finally got its wings.

This airplane is a kick to fly, and it required only a few clicks of aileron trim to bring it to hands-off trim. It flew straight away from the hand-launch with no initial sagging. Subsequent flights off pavement provided no surprises, and rotation occurred with a ground roll of approximately 50 feet. The plane is very light, which helps not only the launch, but also its low-speed flight.



To build the right wing panel, you'll need the construction manual and a triangle square.



The fuselage has plenty of room for any standard radio system. The receiver sits in a bed of 2-inch foam and is held in place with Velcro®.

With full power, the Gobee provides plenty of performance for pilots who are making the transition from trainers. It also gives more experienced fliers a responsive, forgiving craft for Sunday sport flying.

With full power, the Gobee provides plenty of performance for pilots who are making the transition from trainers. It also gives more experienced fliers a responsive, forgiving craft for Sunday sport flying. Loops are as large and round as you want—with enough lift to fly off inverted from a half loop with some down-elevator. Because of the large dihedral, rolls aren't very axial, but they're easy enough for a beginner to handle and make look good. The Gobee will do a little of everything, and it still has some of the "self recovery" that new pilots are used to with trainers.

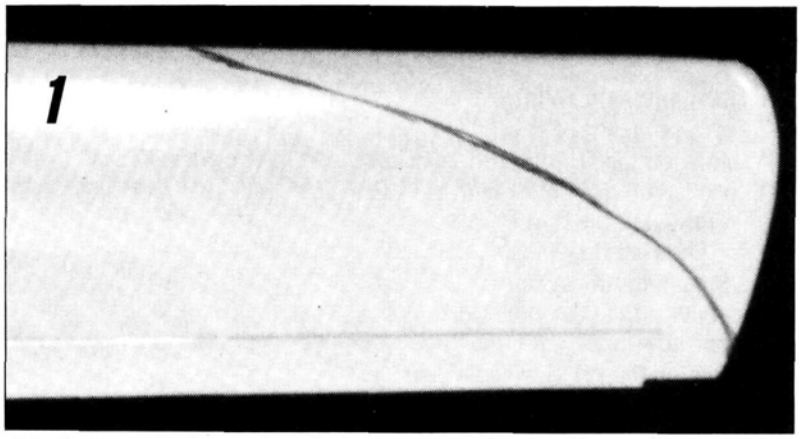
At half power, the Gobee flies much like a primary trainer—only it's a little faster and more responsive. With the throws reduced, it's great for training budding pilots who have had only minimal experience with a primary trainer. The Gobee has excellent low-speed manners and will throttle back for feather-light landings. It has no tendency to tip-stall; stalls break straight ahead, and the plane recovers with slight down-elevator. My first two landings were dead-stick, owing to what the FAA would call "fuel mismanagement." That's right; I ran out of gas!

The Gobee is a high-quality kit with a light, yet sturdy construction and good flight manners. It makes a very good transitional plane for beginner pilots on their way to hotter sport flying. If I built another, I'd lower the dihedral, dress it up with some non-functional struts and throw in a hot .40 engine to really tear holes in the sky. As for now, it's time to get out my skis!

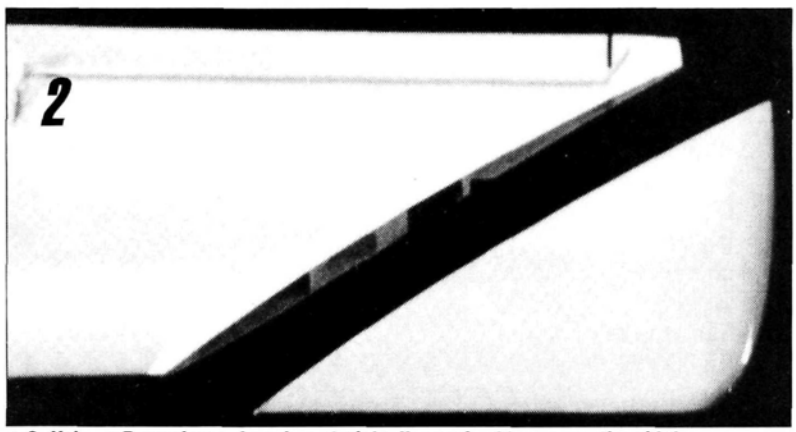
**Here are the addresses of the companies mentioned in this article:*
***Hobby Dynamics,** P.O. Box 3726, Champaign, IL 61826.*
***Balsa USA,** P.O. Box 164, Marinette, WI 54143.*
***K&B Manufacturing,** 12152 Woodruff Ave., Downey, CA 90241.* ■

Making Wingtips WITH Rohacell Foam

by MICHAEL LACHOWSKI



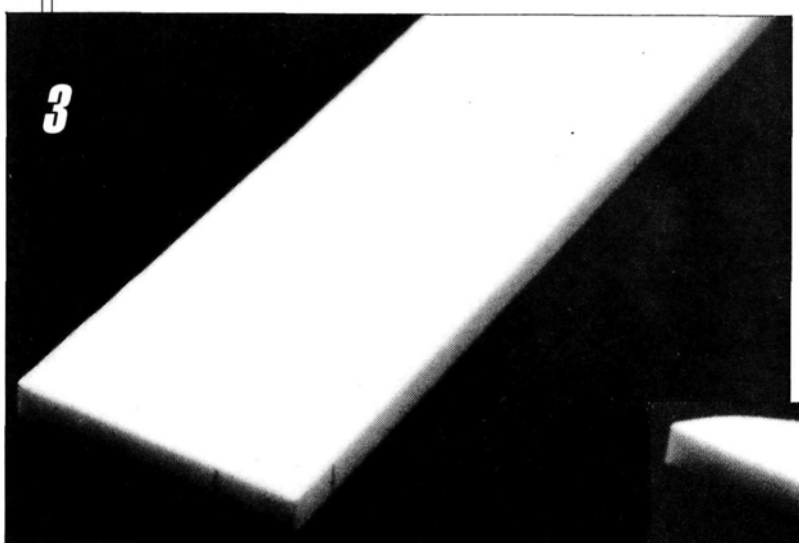
▲1. The Antares' original wing is basically square and made with a small balsa block. Draw the outline of the new wing tip design on the wing. The black line in the photo roughly shows the shape I wanted for the new wing tip.



▲2. Using a Dremel saw, I made a straight diagonal cut to remove the old tip.

WHEN YOU SCRATCH-BUILD a model, you often need blocks of balsa for wing tips or fuselage parts. If you want lightness, you must search through hobby shops, and if you're lucky, you'll find some light pieces. (Diehard scratch-builders probably have a select piece of balsa stashed away from years ago.) Modern technology has now eliminated the need to search and has even produced a block that weighs less than one third the weight of balsa!

This wonder material is Rohacell*—a closed-cell foam. Not only is it light, but it's also available in a variety of densities. As well as Rohacell 31, which I use here, there are Rohacell 51 and Rohacell 71, which have densities of 3.1 and 4.4 pounds per cubic foot, respectively. The "crush strength" of Rohacell 71 far exceeds that of balsa. You won't have to modify your building techniques, because you

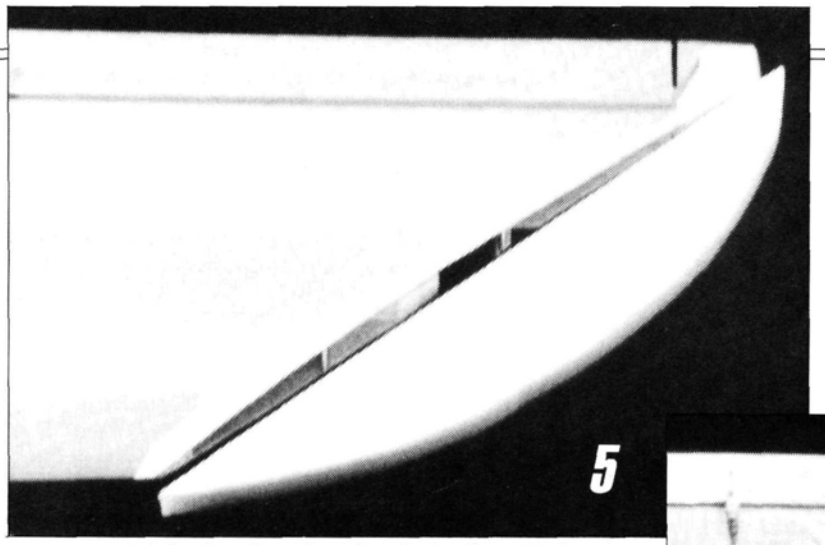


▲3. Rohacell comes in a variety of sizes and densities. For this job, I chose Rohacell 31, which is the lightest variety. It has a density of 1.9 pounds per cubic foot. (Balsa probably has a density of 6 pounds per cubic foot.) Rohacell's crush resistance is comparable to that of balsa, and it's much greater than that of any other lightweight foam you might have worked with.

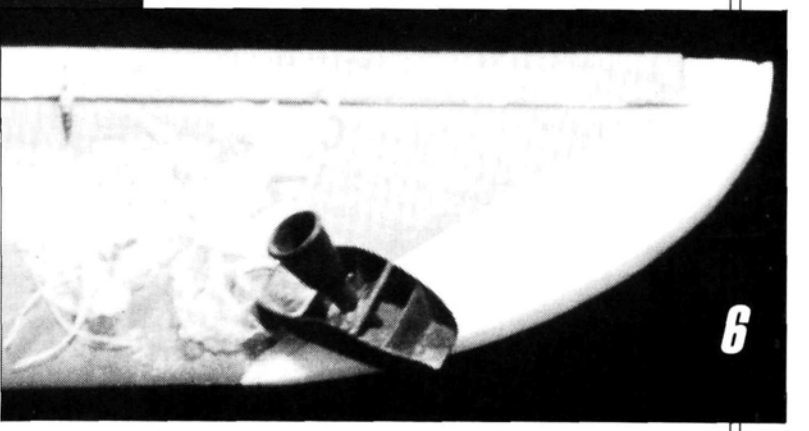
▲4. Rohacell foam can be cut very easily with a saw.

PHOTOS BY MICHAEL LACHOWSKI

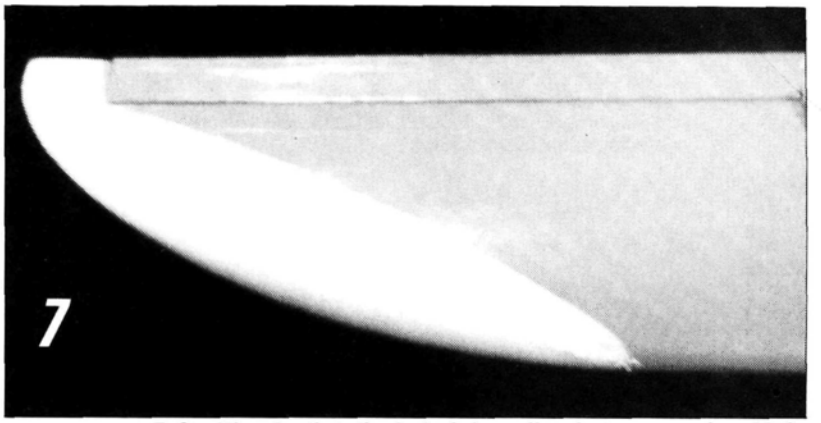
A strong, lightweight alternative to balsa block



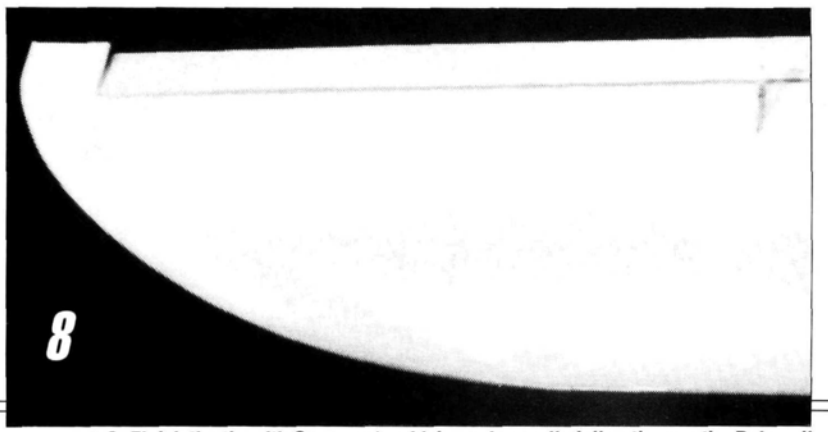
▲5. This view shows the Rohacell wing tip next to the wing; it's ready for gluing. The only glues you have to watch out for are glues that require evaporation. Rohacell is a closed-cell foam, so no evaporation can take place through it. UFO* CA works well with it, and you can also use epoxy, polyester, contact cement, or CA.



▶6. The next step is to carve the wing tip. Rohacell doesn't have a grain, so it's easier to carve than balsa. As you can see, a razor plane works well, and you can also use a knife to shape the tip roughly. Don't hot-wire Rohacell because the vapors produced are dangerous.



▲7. Sand the wing tip to the desired shape. If you're too aggressive with the sandpaper or have a gap between the block and the wing tip, use Carl Goldberg Models'* Model Magic filler where necessary. Strengthen the thinnest part of the Rohacell (near the trailing-edge wing tip) with carbon fiber. To reinforce the wing beyond the aileron, glue a strip of .007x3/8-inch carbon fiber into a slot in the foam where it meets the balsa trailing edge. Cut the slot with a razor saw, and sand the foam so that the carbon fiber is flush with the underside of the wing. (To produce a sharp tip that holds up, you must do this with balsa, too.) Harden the leading edge of the Rohacell by smearing CA along the surface of the sanded leading edge. You can also use light fiberglass cloth to strengthen any thin parts.



▲8. Finish the tip with Oracover*, which can be applied directly over the Rohacell without any further preparation of the surface.

can use Rohacell in the same way as you use balsa.

Rohacell can be used in many ways, but here, I describe my experience with it when I made a new wing-tip shape for my Antares. The photos show a simple way to build a tip like this: cut the wing, add a block of Rohacell, and carve it to the desired shape.

Of course, all this isn't free! Rohacell costs about three times as much as balsa, but if you have to make large parts, it's easier to find Rohacell than to find a decent balsa block. As for the wing shown in the photographs, I've noticed an improvement in the flying characteristics of my aircraft with the new wing tip.

I bought my Rohacell from Composite Structures Technology, which also offers a book on shell construction for those who like to experiment (Rohacell sandwiched between fiberglass to form a hollow wing "shell"). I now include Rohacell in my stock of building supplies, and you should try it, too.

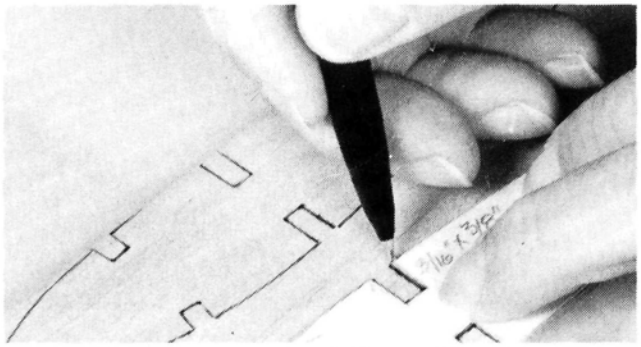
**Here are the addresses of the companies mentioned in this article:*
Rohacell; *distributed by Composite Structures Technology, P.O. Box 4615, Lancaster, CA 93539. Tel: (805) 723-3783.*
UFO; *distributed by Satellite City, P.O. Box 836, Simi, CA 93062. Tel: (805) 322-0062.*
Carl Goldberg Models, Inc., *4734 W. Chicago Ave., Chicago, IL. 60651*
Oracover; *distributed by Hobby Lobby International, 5614 Franklin Pike Cr., Brentwood, TN 37027.* ■

HOW TO:

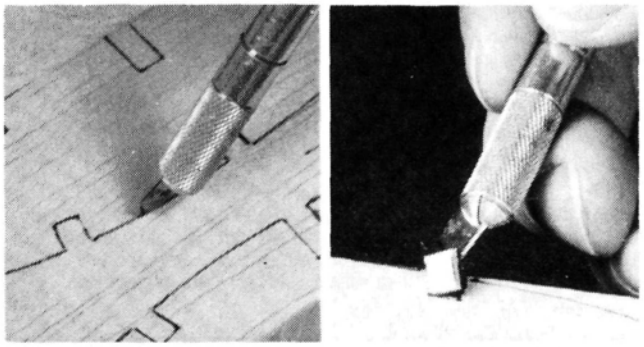
by RANDY RANDOLPH

MAKE RIBS WITHOUT POWER TOOLS

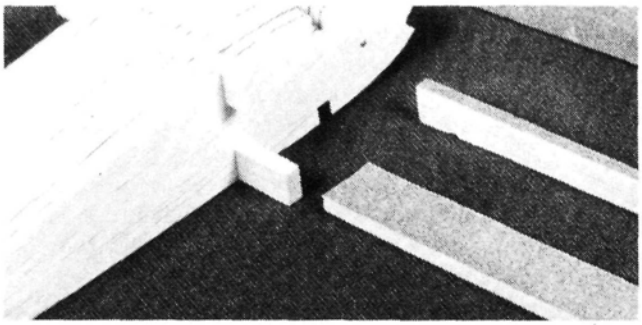
Scratch-building is one of the most satisfying aspects of modeling. There's no thrill like that of flying an airplane that started as an assortment of balsa sheets that you stripped, cut and shaped. When you start a project, most of the small parts you have to make are wing ribs. The photos show how, with only a modeling knife and some sandpaper, you can cut out and finish ribs for a constant-chord wing.



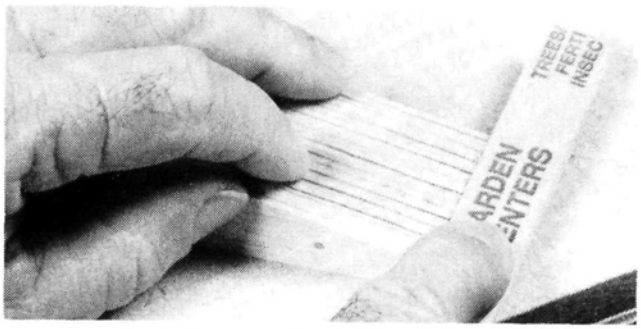
1. *All plans show a typical wing rib. Trace a rib's outline onto paper, then glue the paper to a piece of card stock. (A glue stick works well here.) Make a card template by cutting around the rib's outline. To make a printed sheet of ribs, trace around the card template as often as necessary with a fine fiber-tipped pen.*



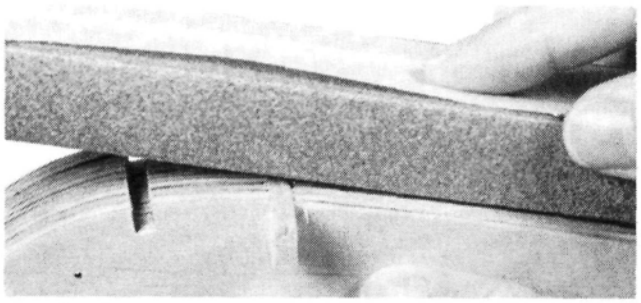
2. *(a & b). Use a small modeling knife to cut out the ribs, taking care to cut on or outside the lines—never inside them. Cut from the highest point on the rib to the leading or trailing edge so that the wood grain takes the blade away from the line and thus eliminates the chance of undercutting. Cut out the notches before you cut the rib free of the wooden strip.*



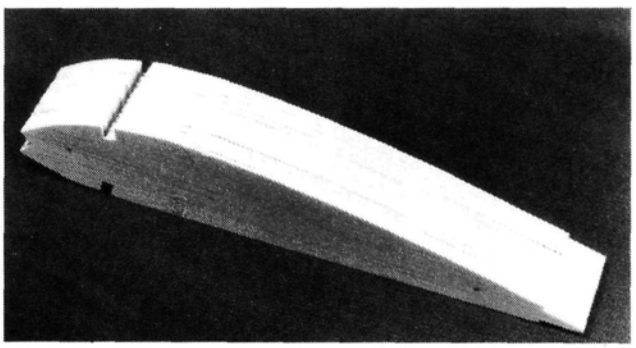
3. *Make two simple sanding tools by gluing strips of 150-grit sandpaper onto balsa strips. One strip is for the side of the notches and should be thinner than the spar notch; the other is of spar stock with a strip of sandpaper on one edge for deepening the notches (if necessary). You'll also need a regular sanding block.*



4. *Pin all the ribs together, using the spar notches to align them. The tool made from the thinner stock is handy for truing the trailing-edge notch, as well as the trailing edge itself. Sand the edges to make the ribs as close to identical as possible.*



5. *Sand the ribs with a sanding block. If you put scraps of spar stock in the spar notches and insert pins through the rib stack, there's less likelihood that the stack will shift while you're sanding. Sand until you've removed all the pen marks. If necessary, deepen the notches slightly so that the spars fit exactly.*



6. *When you've sanded the stack of ribs, they'll be identical, and they'll be as good as, or even better than, those produced with a band saw (after which sanding is still necessary).*

CARL GOLDBERG MODELS

Ultimate Bipe

Setting new aerobatic standards?

by BREN BAILEY

"THE ULTIMATE THRILL"—that's what the ads for the new Carl Goldberg Models* 10-300 Ultimate biplane model say. Is it? After 86 hours at the workbench and a score of flights, I can give you my answer.

THE KIT

The kit box was so big that the wood enclosed in its separate compartment looked almost lost. Fearing a shortage, I immediately checked its contents against the two parts-identification pages in the 60-page construction manual. (A second, 19-page booklet outlines assembly and covering details common to the entire CGM line.) Everything except one aileron pushrod and an inter-aileron connecting rod was there. Rather than clip and mail the missing-parts request form back to the company, I simply crafted replacements out of spare stock.

PHOTOS BY BREN BAILEY AND HARRY SEWELL

SPECIFICATIONS

Type: *Fun-scale sport plane*
Wingspan: *53 3/4 inches*
Weight: *8 pounds*
Wing Area: *935 square inches*
Wing Loading: *19.7 ounces per square foot*
Power Req'd: *80 to 1.20 4-stroke; .60 and larger 2-stroke*
No. of Channels Req'd: *4 (rudder, elevator, aileron, throttle)*
Sug. Retail Price: *$180*
Features: *the Ultimate bipe has an easy, self-aligning construction and outstanding flight performance.*
Comments: *this approximately 1/4.4-scale rendering of the familiar Ultimate biplane combines disparate elements—conservative design, dated die-cut technology, ultra-simplified construction and a cutting-edge flight envelope—to yield an extraordinary value.*

The die-cut balsa sheets were banded together apart from the lite-ply, and the strip stock was separated into wing and fuselage bundles. The wood was good to excellent; the die-cutting was crisp with little crushing; and the hardware package was incredibly complete. (I made additions and substitutions to the hardware, but this was owing to personal preference, not need.) All I needed to go flying was adhesive, covering, paint, a spinner, a propeller, an engine, fuel line, a fuel tank, main wheels, standard 4-channel radio gear and a tail wheel.

I spread out the plans so I could refer to them as I read the instructions. One 33x57-inch printed sheet shows the fuselage three-views with fin, rudder and mechanical details. A second, 19x57-inch sheet shows a wing, the stabilizer and an elevator half. In addition to revealing every conceivable construction and alignment detail, the plans also show so many deviations from scale that I realized that this was strictly a fun-scale model. The instructions were marvels of logic and clarity, and each was accompanied by a photo or line drawing.

CONSTRUCTION

Framing the tail group took 6 hours. The first piece called out—the die-cut cente r platform for the stabilizer—didn't fit over its counterpart on the plans! While trimming it, I grimly envisioned having to similarly adjust each of the hundreds of other die-cut parts. I was therefore overjoyed that only two other pieces fell short of perfection: the turtle deck didn't quite meet the top of the stabilizer, and the fuselage front center sheet didn't completely fill the gap between the two side sheets. Both mismatches were easily fixed with lightweight filler.

The elevators and rudder had a $^{5}/_{16}$-inch-thick open framework. The stabilizer and fin consisted of $^{1}/_{16}$-inch sheeting over a $^{3}/_{16}$-inch frame. Rounding the edges was easy with the sanding tool provided (assembly is required). I temporarily connected

Gordon Price's original Ultimate Bipe (model 10-100) is shorter and squatter than later versions.

For several years, a rumor has been circulating among modelers that the full-size Ultimate biplane is an enlarged version of a successful miniature-aircraft design. To investigate this story, I interviewed AMA President Don Lowe and the designer of the CGM Ultimate, Dave Patrick. Their comments revealed a history even more amazing than the rumor!

Which came first...?!

"Yes, there was *one* model that preceded Gordon Price's Ultimate 10-300," Lowe told me. "Its design was based on drawings Gordon had already generated." Lowe and Bob Godfrey had offered to built a model to act as a test bed for design changes they thought might improve stability and minimize control coupling. Raising the stabilizer/elevator assembly was one of the fundamental corrections, so those surfaces were made adjustable.

"On the first flight," Lowe said, "the model took off, completed a procedure turn and crashed. The elevator had begun to flutter, and there was absolutely nothing I could do about it."

I asked if any other models had preceded the full-scale 10-300. "To my knowledge, no," he replied, "but despite the failure of the test model, Gordon incorporated many of our recommendations—an extended tail, the stab position and the cowl shape, for example."

The 30-percent Ultimate kitted by Godfrey's Precision Built Models turns out to be a model designed *after* the full-size 10-300 had been completed. So much for a great rumor!

"The model Bob Godfrey and Don Lowe built crashed early in its first flight," Patrick confirmed. He also agreed that Price's use of Lowe and Godfrey's ideas helped to create a good, full-size, aerobatic aircraft.

"But it's still not a perfect airplane," Patrick continued. "Joan Osterud, a Californian pilot who now owns the Blue Hawk Ultimate, isn't completely satisfied with its handling." Osterud contacted Patrick to see what changes he had made in developing the CGM Ultimate. She's pondering his ideas as she reworks her 10-300 to improve its trim.

At this point, I got a feeling akin to déjà vu. Gordon Price altered his original vision to accommodate recommendations from experienced pattern modelers. Subsequently, several models of Price's aerobatic bipe were designed and kitted. The most recent—the CGM Ultimate—featured "minor changes to improve flight characteristics." Now the full-size Ultimate's owner is considering making the same "minor changes" to improve her dream machine.

Noted aerobatic pilot Joan Osterud owns this later version of the Ultimate—model 10-300. Since this photo was taken, the plane has been refinished with a new color scheme.

While the full-scale 10-300 wasn't a scaled-up pattern model, it does represent a unique cooperation between amateur modelers and builders of full-size planes!

the components with Sig* Easy hinges. (The point hinges provided in the kit would have been satisfactory and almost as easy to install.)

THE WINGS

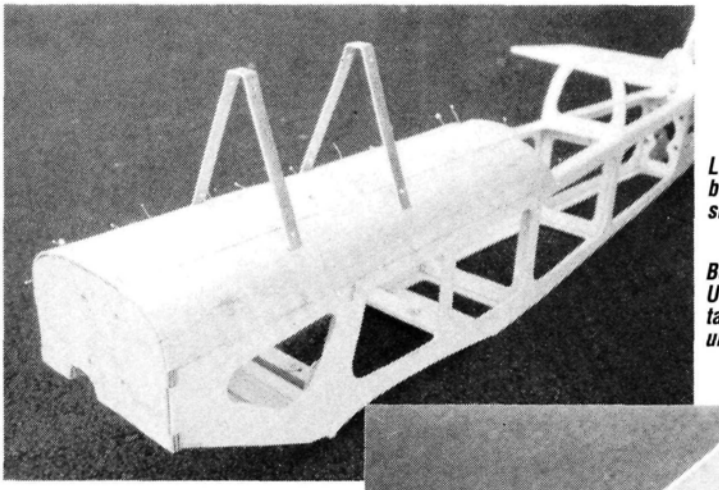
I spent 15 hours roughing-out the wings. Their conventional design features spruce spars and balsa and lite-ply ribs. Breakaway rib-alignment tabs, notched trailing edges and shaped leading edges really sped construction. After applying the leading and trailing edges, the center sheeting and cap strips, I sanded the ailerons' leading edges to shape and hung them with Easy hinges. At the bellcranks, I used Z-bends instead of the recommended right angles and snap nuts. After reinforcing the center sections with nylon tape and doing preliminary sanding, I moved on to the fuselage.

THE FUSELAGE

With its typical CGM "slot-tab" design, the fuselage virtually fell together. I used epoxy instead of the recommended CA in high-stress areas, e.g., the firewall and its reinforcements, the landing-gear doublers and triplers and the wing-saddle doubler. I also epoxied the wing and landing-gear mounts into place. To achieve the proper distance between the firewall and the spinner, I installed a 1/4-inch plywood spacer.

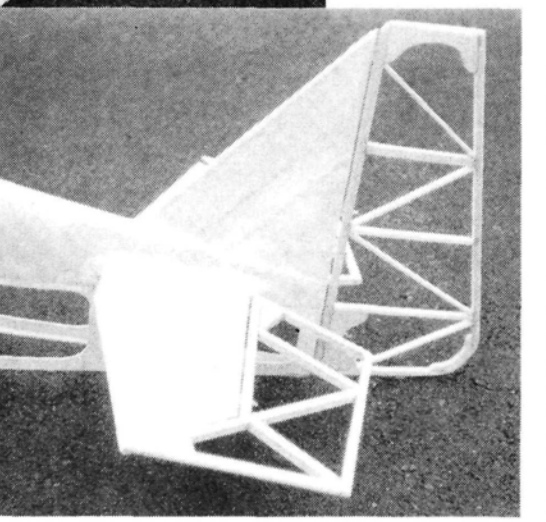
While working near the firewall, I noticed the first of two possible design shortcomings. Removing the "punch-out" from the bottom front fuselage piece leaves only a film covering between the muffler and the interior. I strongly recommend that you leave the punch-out in place and secure it by applying thin CA to its outline. I think it's more important to insulate the radio equipment from hot exhaust than to save a fraction of an ounce.

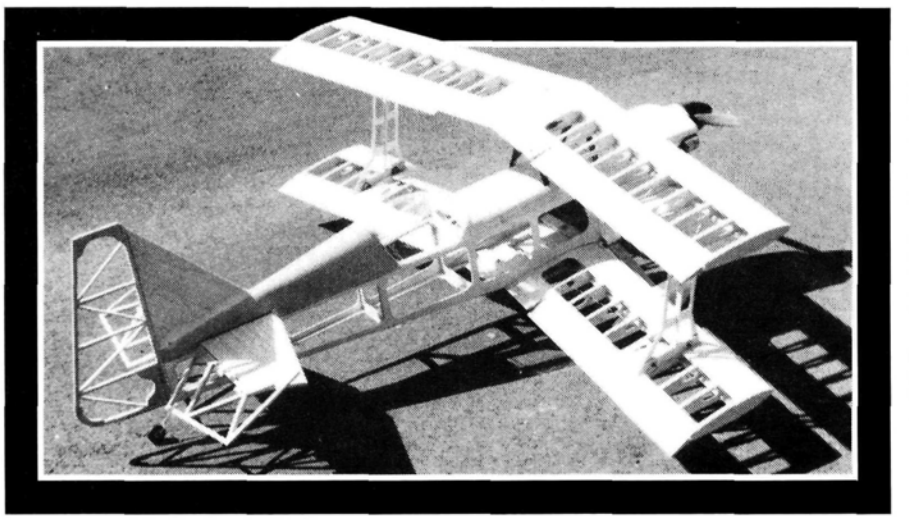
I had no problem aligning the bottom wing, installing the cabane or sheeting the fuselage front, but I used slow-setting epoxy to position and fasten the empennage. Eleven hours after I had started the fuselage, it was finished.



Left: The fuselage begins to take shape.

Below: The Ultimate's built-up tail feathers are unmistakable.





The completed wooden frame is beautiful. The author strengthened the interplane struts by installing 3/8-inch hardwood-dowel pieces to take the steel bolts used to join the strut to the wing.

OTHER COMPONENTS

The final construction stages involved several small sub-assemblies: interplane struts, landing-gear skirts, wheel pants, the fuel-tank tray and the engine cowl. I found the second design flaw in the interplane struts. If I assembled the struts as directed, steel bolts could crush the soft balsa where they're attached to the wings.

This problem is easy to solve; simply drill 3/8-inch holes through the struts, glue in hardwood-dowel sections, then mark and drill the dowels to accept the mounting hardware. This eliminates the chance of crushing, and the hardwood "bushings" allow secure tightening.

I tried a new adhesive—PFM from Innovative Model Products*—for bonding the landing-gear skirts to the gear wire. The clear, one-part, silicone-like glue adheres as well as epoxy, yet it retains more plasticity or "give."

The pants and cowl required more assembly, trimming, filling and sanding than I like, but the results are light, sturdy and attractive. Before installing the cowl, I added a Du-Bro* Kwik Fill fuel valve on a bracket attached to the firewall flush with the fuselage side. This eliminated the need for a bothersome, three-line fuel system.

After 15 hours of constructing these odds and ends and aligning and mounting the top wing, it was time to cover and

READER REPORTS

KELVIN ESPADA, KADENA AIR FORCE BASE, OKINAWA, JAPAN

It wasn't until recently that we heard about Goldberg's Ultimate in a 60 size. Another R/C flier on the island immediately bought one, and he told me to do the same. Much to my surprise, he had his airplane framed up in four days.

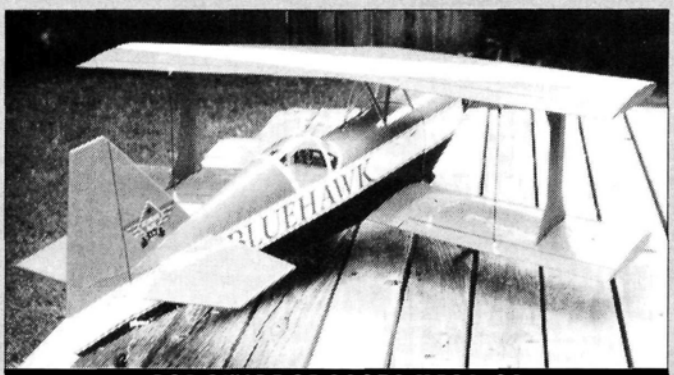
I had two concerns: the mount for the cabane struts seemed weak, and the tail section seemed to need more reenforcement. I decided to get one of these babies, but I opted to build it according to the instructions, without any modifications.

It's practically impossible to build this aircraft crooked or warped. Everything locks into place, and you only glue joints when you're sure everything is lined up. The wood is well cut and of an acceptable quality, but I recommend that you sand the parts before you glue them.

Powered by an O.S. 61 SF ABP-P long-stroke engine swinging a 13x6 prop and covered with Top Flite black MonoKote, my Ultimate weighs 5 pounds ready to fly. I use an Airtronics Vanguard 6-channel PCM. Despite my initial concern about whether it would stand up to excessive Gs without losing a wing, the Ultimate flies fantastically well. It performed all the maneuvers as advertised, including knife-edge loops and Lomcevaks.

Although this large biplane flies extremely well, it does have its limitations. For example, at high speeds its tail becomes somewhat unstable and bounces around. I fly mine at between a quarter and half throttle, except for vertical maneuvers. It tracks well but, again, winds affect this, so be prepared to use the rudder. It tracks best if you add 1/2 to 1 degree negative incidence to the top wing.

This Ultimate is a class act! I can't think of any other airplane that would enable you to learn to fly pattern as well as this bipe. Its size keeps it plainly visible and makes it quite impressive, but there's one mod that must be done if you're going to save your self respect: give your Ultimate a smoke system!



ROB SWIRE OF COSTA MESA, CA

I've wanted an Ultimate biplane for a number of years, but they were expensive and difficult to find. Finally, Goldberg designed and kitted a pocket-size rocket!

The kit's contents are well-packaged, and the quality of the wood and ABS plastic is good. I would have preferred an aluminum swept-back landing gear, however, instead of the supplied wire-and-balsa fairings.

During construction, you might be tempted to strengthen certain areas (e.g., the landing gear and wire braces)—Don't. The Ultimate isn't a trainer that's designed and built to perform precision aerobatics, so it doesn't need "beefing up." Keep it light!

To do the plane justice, forget about installing the recommended 60-size engine, and step up to a good .90 2-stroke or .120 4-stroke. Don't be afraid to add a little weight to the tail. I used a Super Tigre .90 2-stroke, a Tatone muffler, a Zinger 13x10 prop and a 3-inch Tru Turn spinner.

Try to avoid using one servo to operate all four ailerons by the bellcrank and pushrod method. It's much easier to install two servos in the bottom wing. This cuts down on aileron "slop," allows many mixing combinations and simplifies flight trimming. My ship is controlled by a Futaba 7UAP radio, which includes five standard servos and one BB Futaba servo for the rudder (pull/pull system).

There's plenty of room in the fuselage for a smoke system, and it's worth the extra effort to install one. I chose a Perry Smoke Pump that uses crankcase pressure and an 8-ounce smoke tank.

I covered my model with Goldberg Ultracote and used Black Baron paint for the cowling, wheel pants and trim.

THE ULTIMATE IN FLIGHT

The Ultimate flies flawlessly, and its vertical performance is awesome. Knife-edge flight is easy with a little rudder input. A little down-elevator and left-aileron input is needed to sustain a straight path; otherwise, the Ultimate goes exactly where you point it and tracks perfectly. Landings are easy, too, so don't be afraid to slow the plane for beautiful three-pointers.

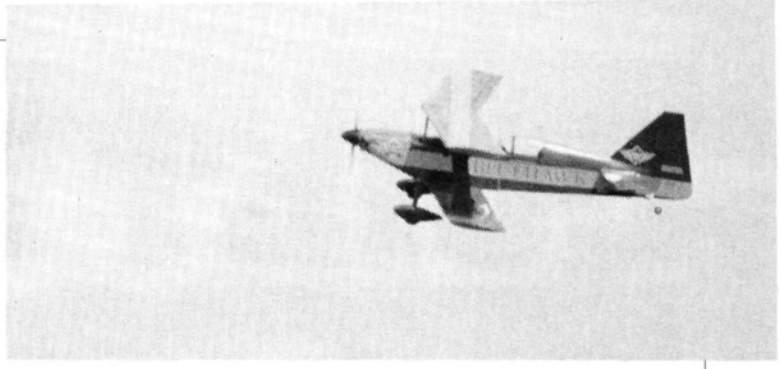
Provided it's built true, is properly balanced (don't forget the lateral) and has the right engine, this plane should be a worthy addition to your collection. It certainly won't sit around long enough to gather dust; mine has logged more than 75 flights!

paint. So far, I had invested 47 hours in the project.

COVERING AND PAINTING

After final-sanding the body and wiping it with a tack cloth, I ironed on dark blue CGM UltraCote. It clung well and stretched smoothly around corners. A 400-degree (F) iron handled all the wrinkles except those on the interplane struts, but a quick pass with a heat gun straightened them out.

I masked the Ultracote, scuffed its surface with no. 0000 steel wool, and spayed on the side and top stripes with Coverite's* Black Baron Cub yellow epoxy paint. The closest match to the blue Ultracote I could find in a spray can was Testor's* dark blue enamel. I "fogged" several coats onto the cowl and pants. After they had thoroughly



dried, I masked and scuffed the cowl and applied the yellow. After pinstriping the cowl, fuselage and rudder with 1/16-inch Great Planes* blue tape, I applied the decals to the cowl. Then, to fuelproof the cowl and the pants, I sprayed them with Black Baron clear epoxy.

Next, I applied the remainder of the pressure-sensitive decals, which were accurate, bright and crisp. I then installed the landing gear with wheels and pants, the canopy, the engine (a new O.S.* .91 Surpass), the cowl, the radio gear and the tail wheel. I adjusted the controls to the "gentle" settings and punched the time clock. It had taken me 39 hours to finish and apply markings.

FLYING

On the day of the test flight, the wind was gusting and swirling—averaging 14mph at the grass strip. I had arranged for a pattern trainer and a sport biplane to be present for comparison. Both were built from kits by well-respected manufacturers and powered by broken-in, .61-size 2-stroke engines.

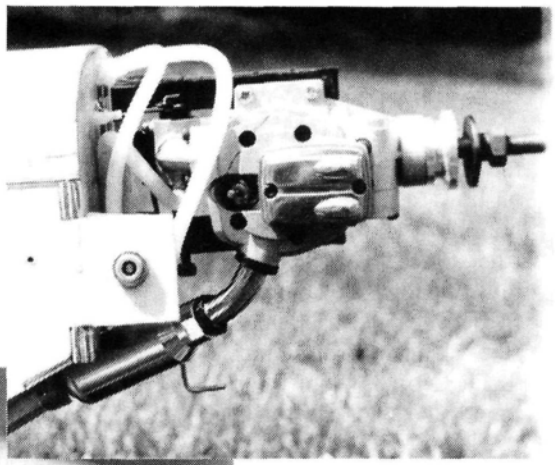
On its first takeoff roll, the Ultimate's tail lifted on its own after 25 feet. No rudder correction was necessary. Slight pressure on the elevator stick caused the model to break ground approximately 100 feet later. It then rose majestically from the runway center line without wavering. Compared with those of the pattern trainer and sport biplane, the CGM Ultimate's takeoff was breathtakingly scale-like and unbelievably easy.

In the air, the CGM Ultimate matched or exceeded the performance of its more specialized brethren in all categories but one. With its extreme tail moment, the pattern trainer tracked somewhat truer in straight, level flight under the blustery test conditions. Since the initial flights, however, I've been able to extract more power from the O.S. .91 Surpass through break-in, and the "jittering" I observed during the first tests has diminished considerably.

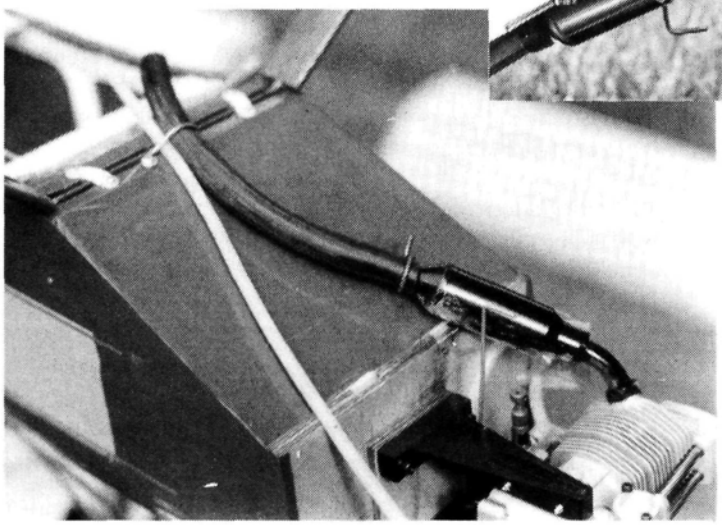
In all other respects, the CGM Ultimate sets new standards for fun-scale aircraft! Inside and outside loops, Immelmanns, axial rolls, Cuban-8s, stall turns, split S's, inverted flight (maintained by a moderate amount of down-elevator), point rolls, knife edges, and spins—all were as precise as those with the pattern trainer and easier to execute than similar maneuvers with the much faster sport biplane. The Ultimate's snap rolls had to be seen to be believed! Initiation was instantaneous, and precise recovery was just a matter of releasing the sticks. Avalanches became a delight, rather than a chore.

Landings required power for a controlled sink. Chopping the throttle to idle when the plane was about 3 feet off the deck and gradually feeding in up-elevator repeatedly produced the prettiest full-stall landings I've ever achieved.

In subsequent flights, I've accomplished a fair Lomcevak, but I haven't yet been able to complete a knife-edge loop with my Ultimate. Wags at the field say I need to install a 1.20-size 4-stroke, but I think that would be overkill. Besides, I have yet to try the "aerobatic" control throws, which included a whopping 23 degrees of rudder!



Above: Trial-fitting the O.S. 91 Surpass engine.



Left: To protect the fuselage's interior from muffler exhaust, keep the lower, front fuselage "punch-out" piece and glue it into place. Notice the exhaust extension tube.

CONCLUSION

Is the CGM Ultimate biplane the "ultimate thrill"? Is this fun-scale model with nearly impeccable pattern performance the *ultimate* R/C model? In terms of envious stares per dollar and flying thrills per construction hour, the Goldberg Ultimate can't be beat!

**Here are the addresses of the companies mentioned in this article:*
Carl Goldberg Models, Inc., *4734 West Chicago Ave., Chicago, Chicago, IL 60651.*
Sig Manufacturing Co., *401 S. Front St., Montezuma, IA 50171.*
Innovative Model Products, *P.O. Box 4365, Margate, FL 33063.*
Du-Bro Products, *480 Bonner Rd., Wauconda, IL 69984.*
Coverite, *420 Babylon Rd., Horsham, PA 19044.*
Testor Corp, *620 Buckbee St., Rockford, IL 61104.*
Great Planes Model Distributors, *1608 Interstate Dr., Box 4021, Champaign, IL 61824.*
O.S. Engines/Great Planes Model Distributors. ■

QUIET FLIGHT

PROJECT EXPLORER, D.U.S.T.

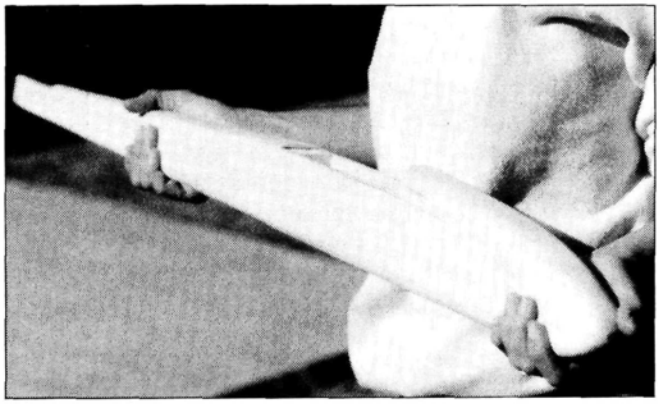
by JOHN LUPPERGER

I HOPE THOSE who've decided to participate in the Project Explorer 2M will enjoy building and flying this model. We'll start with the fuselage and the tail surfaces. The modifications to these parts are very easy, and they really improve the finished model's strength and performance.

SIMPLE AND STRONG

Although we'll build the fuselage using most of the supplied parts, we'll use triangular stock instead of the 3/16x1/4-inch stringers that come in the kit. Use either 3/8- or 1/2-inch triangular stock, depending on how much you want to round the finished fuselage. (Note: if you use 3/8-inch stock, you'll be able to use standard servos, but if you use 1/2-inch stock, you'll probably have to use micros.)

To allow for the stringers, use a small piece of the triangular stock as a template, mark the bottom corners of formers F-1, F-2 and F-3 and cut off the excess corner material. Do the same on the top of former F-3. Build the rest of the fuselage according to the plans and instructions, substituting the triangular stock for the kit-supplied stringers.



The finished fuselage of Project Explorer 2M has a nice, rounded shape and is very strong.

Follow all the steps in the instructions except those on how to install the tow-hook block and trailing-edge filler block. To allow the plywood tow-hook block to fit between the triangular-stock stringers, trim 1/4 inch (or more) off its width. Bevel its outside edges to match the angle of the stringers, and then glue it into place. Usually, you'd angle the trailing-edge filler block for the wing hold-down to accept the wing's center dihedral. Since one of our modifications is to flatten the center dihedral, glue the filler block into place without modifying it.

Finally, finish-sand the fuselage, and round its corners until you can see about 1/16 inch of the triangular stock. Don't sand off any more than this, or you'll weaken the fuselage considerably. The purpose of using triangular stock in the corners isn't to make a completely round fuselage, but to increase the area of the stringers that's glued to the fuselage, and thus increase overall strength.

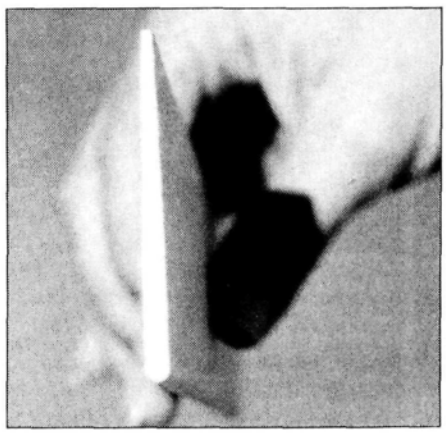
BUILDING THE TAIL FEATHERS

"Frame up" both of the tail surfaces according to the instructions. We'll modify the built-up, fixed, vertical and horizontal surfaces. Using 1/16-inch sheet, we'll add airfoil sections to both stabs and increase their rigidity.

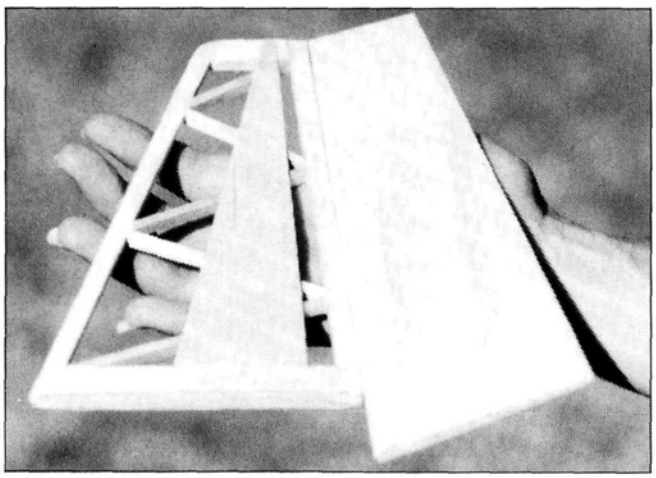
At the bottom of the vertical stab, add a 3/8-inch-wide strip of 1/16-inch balsa. Using 1/16-inch sheet, make a spar that's 1 1/2 inches wide at its base and tapers to 1/4 inch at the top. Glue the spar so that the base is 1 1/2 inches back from the leading edge and the top is 3/4 inch back from it. Repeat these steps for the other side, sand the leading edge, and taper the spar for the last inch at the top. To complete the airfoil shape, sand the rudder to a constant taper.

Cut two pieces of 1/16-inch sheet so that they're 1 5/8 inch wide and long enough to go (chordwise) across the center of the horizontal stab. For the spars, cut four identical pieces of sheet, making them 1 1/2 inches wide at the point where they butt against the center sheet, and 3/8 inch wide at their tips. Glue the bases 7/8 inch back from the leading edge, and the tips 3/8 inch back. Do the same on the other side, sand the leading edge, and taper the spar for the last inch at the tip. Attach the two elevators to the spruce joiner and sand them to a constant taper. Don't worry about trying to taper the center-section sheet at the trailing edge; this will taper naturally when it's covered.

That completes the first



To complete the airfoil shape of the fixed vertical stab, sand the solid-sheet rudder to a constant taper.



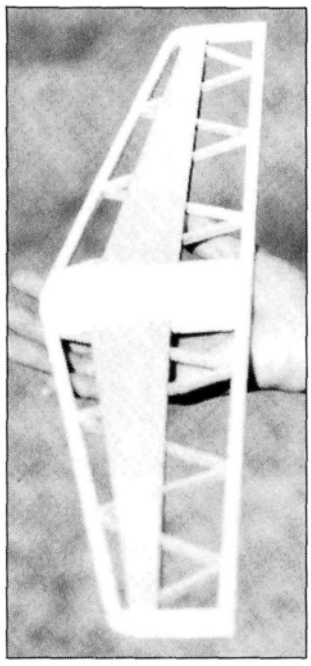
Here's the fixed vertical stab with the bottom sheet and spar in place and finish-sanded. The spar is at about a third of the chord of the stab and rudder combined.

set of Explorer 2M modifications. Next time, we'll start on the wings and, if all goes well with my schedule, we'll cover the plane in the issue after that.

D.U.S.T.

I don't usually write about individual clubs and their endeavors, but the story behind the Desert Union of Sailplane Thermalists' (DUST) flying field is unusual. DUST has been around for many years and has had several flying fields. The club members started out sharing the field in a public park with a power club, but it didn't work out. They moved to a small polo-club field, which ended up being developed. Then they flew from a school yard, which was a little small and had a lot of obstructions. For a while, they used a city-owned Little League field (the grass area was small, but it was surrounded by open fields). Once again, development forced them to find another place.

They contacted the owner of the Empire Polo Club in La Quinta, CA, and made an appointment with him to put on a flight demo and present proof of the club's AMA affiliation (and its subsequent insurance coverage!). The owner, Al Haagen, was duly impressed by the quiet, environmentally friendly sailplanes. (A group of power fliers had lost the use of the field because of noise and other problems.) He had some reservations, however, when he saw a high-G "zoom" launch. He thought that this type of launch could lead to structural failure (which does happen), and he wanted to be absolutely sure that none of the models would crash into the stable area. After much deliberation, an agreement and lease were drawn up. Mr. Haagen asked the club to pay for the use of his property; he thought that, if the club was serious about using the field, this "show of good faith" was necessary.



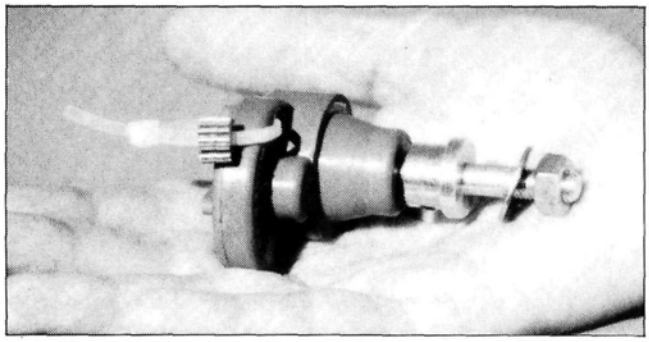
Here you can see the additional center sheet and spars on the horizontal stab. This setup creates an extremely stiff structure with a slight airfoil shape.

DUST's first big test came when they hosted an SC Squared (Soaring Clubs of Southern California) contest. Usual turnout for these events is between 50 and 70 pilots, and Mr. Haagen was on hand to see how the club would handle things. In the contest announcements, they stated that no zoom launches would be allowed. Everyone complied with this rule, and things went very well. Mr. Haagen was pleased, and he gave the club the "OK" to plan a two-day contest. Today, the Empire Polo Club is a world-class flying site, with acre upon acre of perfectly manicured grass.

The fact that sailplanes and electrics are quiet is a great advantage in site procurement. If you let the site owner set the tone for all the negotiations and you're willing to make concessions, you might just end up with a world-class site!

MASTER AIRSCREW GEAR DRIVE

Master Airscrew* has introduced a great gear-drive unit for ferrite motors that have small pinion shafts. It costs only $15.95, and it comes in three gear ratios: 2.5:1, 3:1 and 3.5:1. The 3/16-inch output shaft is supported by two ball bearings; the main gear is of nylon; and the metal pinion gear is press-fit onto the shaft. This compact unit seems to be well-made. I'll let you know about it after I 've tried it..



The Master Airscrew gear-drive unit is compact and very light.

Next time, in addition to more Explorer modifications, look for my product report on the new "quiet flight" goodies I saw at the '91 International Trade Show. Till then...good thermals and a full charge!

Here's the address of the company mentioned in this article:* ***Master Airscrew**; distributed by Windsor Propeller Co., 384 Tesconi Ct., Santa Rosa, CA 95401.* ■

ENGINE EVALUATION

O.S. D9 1 VR DUCTED FAN

by MIKE BILLINTON

THE NEED OF scale model jet aircraft for high-rpm engines with a high power-to-weight ratio (to match the efficiency of the centrifugal fan) increases as rpm increase. This has never been more true than with the massively "stretched" O.S. .91 VR—a 15cc, state-of-the-art model racing 2-stroke. High-tech engineering has enabled O.S. to produce an engine that possibly gives higher BHP in standard commercial form than any other 15cc racing engine. It certainly produces the highest BHP/pound (even though I used relatively mild fuel in my tests).

A remote needle is optional. The needle can also be used in the carburetor in the usual way.

Squeezed into a .65 crankcase that has been slightly modified to accommodate the crankpin's extra sweep, the O.S. .91 VR's bore and stroke are greater than those of the .65. Bore has been increased from 24.8 to 27.7mm and stroke from 22 to 24.5mm (almost a 12-percent increase in both cases). This shows a clear progression of large, O.S., ducted-fan engines: the earlier .65ci engine claimed .282 BHP/cc; the .77ci engine claimed .306 BHP/cc; and this new engine is rated at .325 BHP/cc. These increases have occurred inside an engine that's almost the same size as the .65!—the .91 is a highly stressed animal!

I've previously commented on the large internal and external dimensions of the Italian, marine, racing, 15cc units. They're all approximately 50 percent heavier overall than the O.S. .91 VR. (Their pistons, crankshafts and connecting rods all weigh 50 percent more than those in the .91 VR.) As a result, the horsepower of marine engines has been restrained by rpm limitations. In keeping with the arduous competition regimes involved, these engines are, however, significantly stronger and more reliable.

The design of the O.S. .91 seems to have been guided by a different philosophy. Its light reciprocating parts allow the high rpm necessary to achieve top hp, and its overall lightness results from the scale jet aircraft's need for a very high power-to-weight ratio. Somewhere along the line, there must be a reduction in engine strength and reliability; any manufacturer of ducted-fan engines has to come to terms with this.

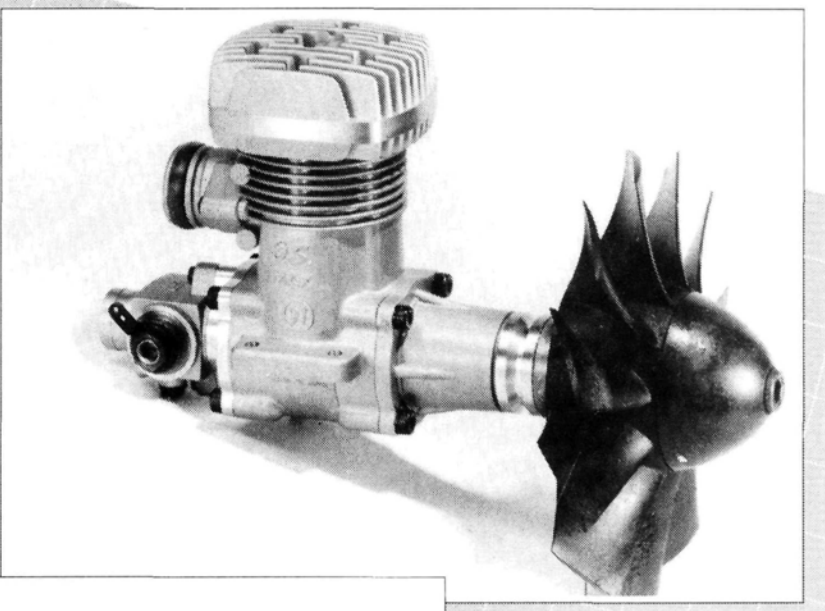
MECHANICAL POINTS

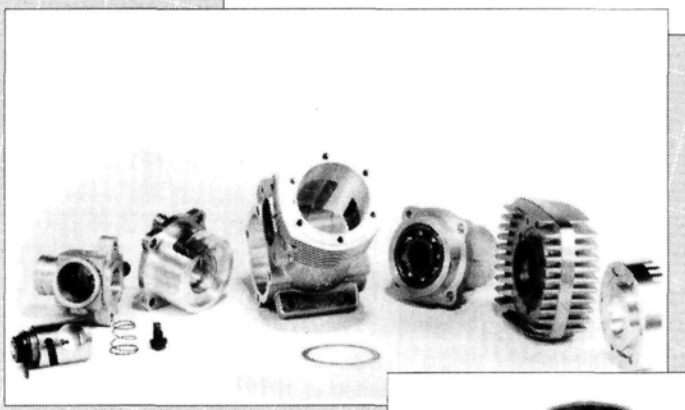
Apart from its rear-drum induction, the .91 VR resembles O.S.'s earlier, conservative, VR, 2-stroke racing engines. It's interesting that O.S. hasn't adopted the fashionable 5-port cylinder design favored by some other producers, but this omission doesn't seem to have harmed the engine's performance!

I'm not sure why, but O.S.'s three, large, ducted-fan, engine cylinders aren't plated in the same way: the 65 and 77 both have traditional ABC chromed-liner setups, but this .91 has nickel-silicon plating. Chrome plating wasn't the norm for O.S., and the company has now reverted to the satisfactory ABN nickel plating—perhaps because there's now ample proof that it performs just as well?

The .91's cylinder exhaust timing is conservative (166 degrees) and, with blow-down at a modest 18 degrees, there's

A lightweight with a heavyweight performance





Above: The well-designed, soundly constructed Dynamax fan was used for the dB tests.

Left: On the right, the optional cylinder heads. The test was run with the larger heat-sink version. The rotary drum housing at middle left is machined from solid alloy.

Below: Note the heavily cut-away piston skirt. The rotary drum is of thin hardened steel.

scope for improving performance, but an increase in the strength of the engine's structure would then also be advisable. To suit particular aircraft applications, the engine comes with two cylinder heads, and I used the larger heat-sink version during my tests. (The heads' squish detail and chamber volume are identical.)

O.S. suggests a midpoint, effective-compressive ratio of 8:1, and this allows adequate performance on both high- and low-nitro fuels. It might be possible to increase off-the-shelf performance by using high-nitro fuels; in fact, it's probable that the .91 VR could be the first to reach 6hp on 50-percent nitro fuel. With the head modified to allow an increase in combustion volume to, say, 1.6cc, and the effective ratio lowered to 7:1, this would be a certainty.

The engine has a standard, plain-bearing, aluminum connecting rod with phosphor-bronze bushings at each end, and there's a spiral lubrication groove in the big-end bush. To improve breathing and reduce reciprocating weight and piston friction in one go, the high-silicon plain piston has been substantially cut away at the boost side.

The rear-induction cover is machined of solid aluminum and houses a thin-walled rotor drum that's machined of solid steel. The rotor-drum drive is by means of a peg extension off the crankpin. At a total of 199 degrees, the induction timing is reasonably wide and in keeping with the expected 22,000rpm peak.

A strong, compact, 12mm-bore 9B carburetor (without throttle stop) is sensibly bolted directly onto the rear of the induction housing, and my arduous tests failed to dislodge it. (The pinch-bolt style is less secure at high rpm.) Equally, the very short, stubby, practical needle valve was free of involuntary movement during high-rpm vibration, so it contributed considerably to the precise, repeatable, high-power test runs. There's a separate remote-needle assembly, but I didn't use it during tests, because such devices usually lead to a delay between needle movement and engine response, and I wanted to avoid this when using a dynamometer.

At a bare weight of only 25.3 ounces, the 15cc .91 VR ducted fan was clearly a light machine of fearsome potential—as my test results confirm. Even with a Dynamax* fan rotor and a Tom Cook tuned pipe on board, its weight of 34.8 ounces is still considerably less than the 41-ounce average bare weight of the marine 15cc racing engines referred to earlier.

PERFORMANCE

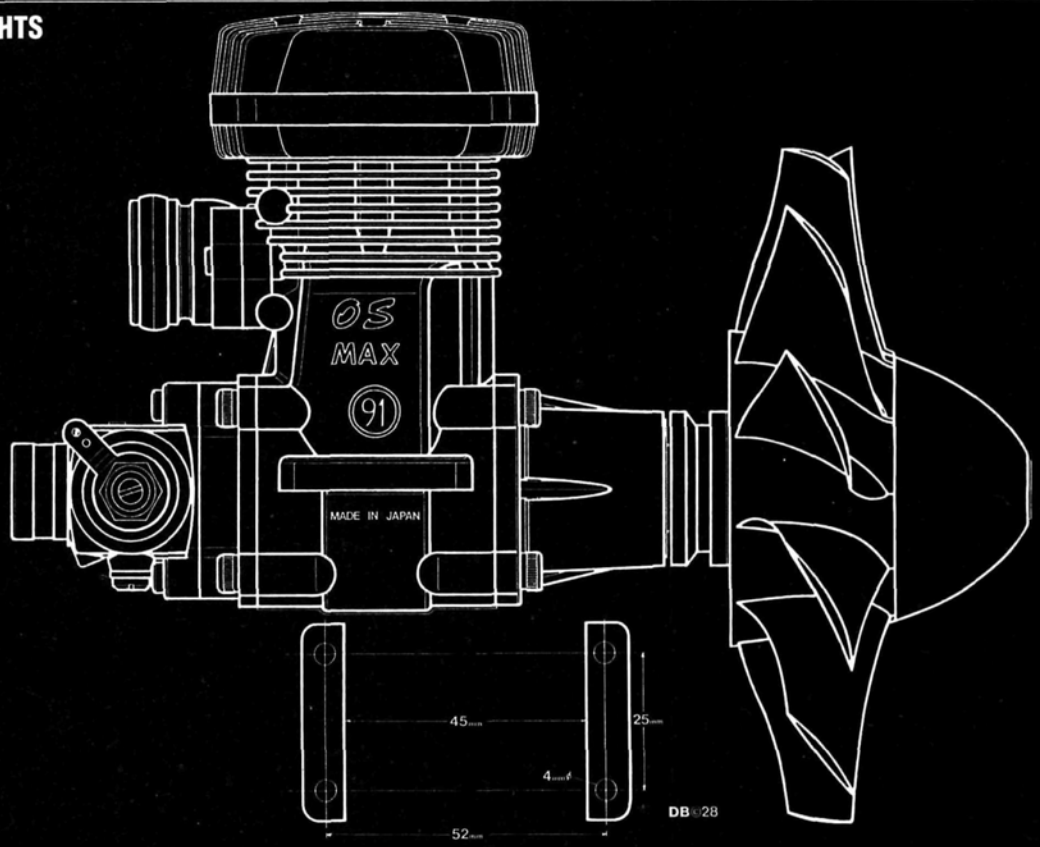
This engine's performance threatened to outstrip that of most standard propellers. After carefully assessing their probable centrifugal breaking strains, I made only a few runs (in open-exhaust form) because of the almost certain reductions in rpm and power. The engine's constructional accuracy and finish meant that it needed only a limited running-in, so I started torque tests early on.

Test 1. Open Exhaust. Fuel: 10 percent nitro/11 percent castor/6 percent ML70 synthetic oils/73 percent methanol. Plug: Rossi no. 6

SPECIFICATIONS

DIMENSIONS & WEIGHTS

O.S. D91 VR



Capacity	0.899 cubic inch (14.74cc)	Cylinder-head squish	0.019 inch
Bore	1.090 inch (27.7mm)	Cylinder-head squish angle	2°
Stroke	0.964 inch (24.48mm)	Squish-band width	0.206 inch (5.25mm)
Stroke/bore ratio	0.884:1	Carburetor bore	0.472 inch (12mm)
Timing periods	Exhaust - 166°	Crankshaft diameter	0.472 inch (12mm)
	Transfer - 130°	Crankpin diameter	0.314 inch (8mm)
	Boost - 129°	Crankshaft nose thread	0.310 inch x 24 TPI ($5/16$ inch UNF)
Rear drum induction:	—Opens - 39° ABDC	Wristpin diameter	0.275 inch (7.01mm)
	—Closes - 58° ATDC	Connecting-rod centers	41mm
	Total Period - 199°	Engine height	4.33 inches (110mm)
	Blow-down - 18°	Width	2.42 inches (61.4mm)
Combustion volume	1.35cc	Length	5.26 inches (133.6mm)
Compression ratios	Geometric - 11.92:1	Width between bearers	1.75 inches (44.5mm)
	Effective - 8.02:1	Mounting-hole dimensions	52x25x4mm
Exhaust- port height	0.344 inch (8.75 mm)	Exhaust-manifold bolt spacing	1.18 inches (30mm)

O.S. recommends the use of "good quality" 10-percent-nitro commercial fuel.

I soon recorded significantly high torque figures and, amidst the uproar, noted a very wide rpm band, which is typical of top model 2-strokes operating in the open-exhaust mode. The decline in hp was gentle enough to suggest that this engine could go well beyond O.S.'s suggested maximum of 22,000rpm, but I was concerned about the engine's survival for the more important tuned-pipe runs, so I stopped at the 23,000rpm mark.

Test 2. Tom Cook tuned pipe (at built-in standard length). Fuel and plug as in Test 1.

This twin-cone tuned pipe is produced by Dynamax's Tom Cook in the USA. It has no rear silencing can and was designed specifically for use on the O.S. .91 fan engine. It has a very convenient built-in spring fixing (à la Rossi), so it's really only amenable to being one fixed length. Clearly, O.S. has done its homework on this, because the actual maximum tuned-pipe resonance occurred very close to its claim of 22,000rpm (so, also, did the hp value—at 4.8). This could be fortunate, because O.S. doesn't provide a tuned pipe, but stresses the importance of the user choosing one. I don't know which pipe O.S. used in its tests, but I guess that they chose a large-volume pipe along the lines of the OPS 90 Marine quiet pipe.

The unmuffled Cook pipe is quiet because it has a relatively small volume and its outlet pipe is smaller than many standard 90 pipes. It's somewhat less noisy and powerful than the

(Continued on page 93)

Frontal area ..... **7.86 square inches (with large heat-sink head)**
Weight (bare) ..... **25.3 ounces (717 grams)**
—with Dynamax fan ..... **31.2 ounces (885 grams)**
—with fan & Tom Cook pipe ..... **34.8 ounces (988 grams)**
Crankshaft weight ..... **3.8 ounces (108 grams)**
Piston weight ..... **0.45 ounce (13 grams)**

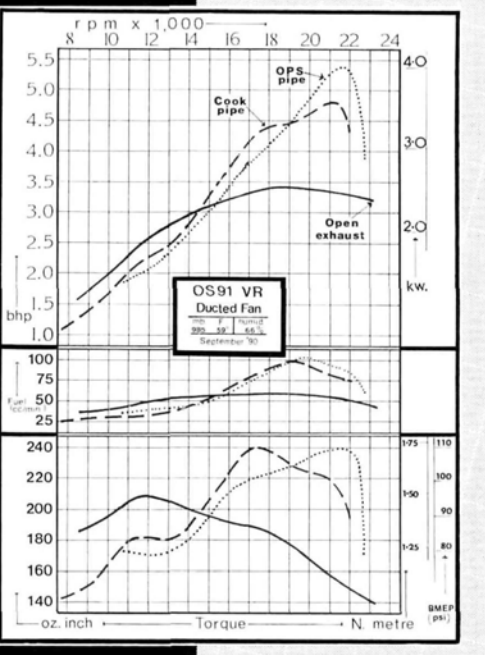
Performance:
Max. BHP ..... **5.39 @ 21,770rpm (OPS pipe/10% nitro)**
4.80 @ 21,150rpm (Tom Cook pipe/10% nitro)
3.47 @ 18,190rpm (open exhaust/10% nitro)
Max. torque ..... **240 oz/ins @ 21,770rpm (OPS pipe)**
240 oz/ins @ 17,246rpm (Tom Cook pipe)
210 oz/ins @ 11,780rpm (open exhaust)

RPM on Standard propellers:	**Open ex**	**T. Cook tuned pipe**	**OPS 90 pipe**
13x6 glass	**13,690**	**—**	**—**
12x6 Graupner	**15,530**	**—**	**—**
10x6 MK glass	**18,700**	**—**	**—**
Dynamax fan	**—**	**21,560**	**21,998**

Performance Equivalents:
BHP/cubic inch **5.99**
BHP/cc **0.374**
Ounce inch/cubic inch **266.8**
Ounce inch/cc **16.28**
Ounce inch/pound **151.8**
Gram meter/cc **11.6**
BHP/pound **3.41**
BHP/kilo **7.52**
BHP/square inch frontal area **0.68**

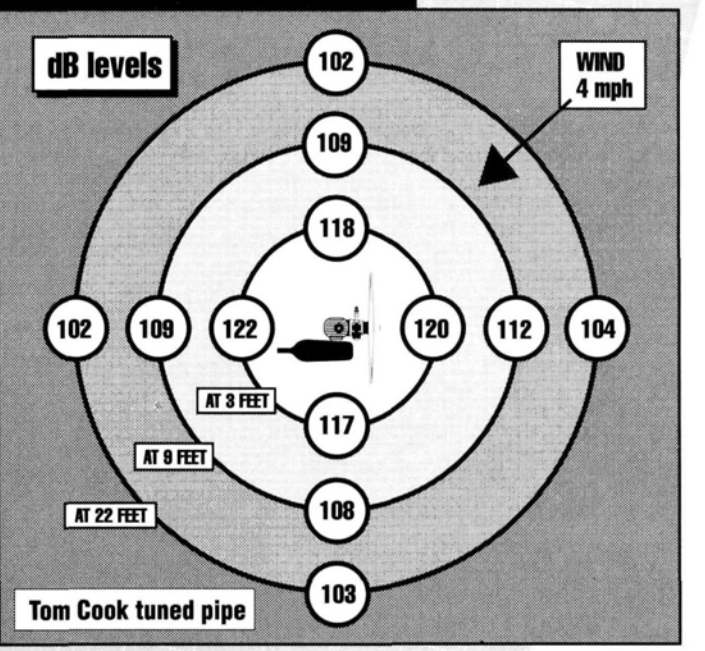
PIPE PARAMETERS

	Cook pipe	OPS 90 pipe
Tuned length— (plug to first max. dia.)	260mm	260mm
Volume	235cc	300cc
Tail-pipe diameter	9.5mm	12mm
Maximum diameter	1.71 inches	1.91 inches
Weight	3.65 ounces	3.65 oounces



SOUND LEVELS - dB.

Engine ..... O.S. 91 VR (Ducted Fan)
Equipment ..... Tom Cook tuned pipe
Fuel ..... 10 percent nitro/11 percent castor oil
6 percent ML70 oil/ 73 percent methanol
Temperature ..... 60° F.
Humidity ..... 69 percent
Engine position .. 3 feet above the ground
Propeller ..... Dynamax fan
Mean rpm 21,300
Sound meter ..... Radio Shack's 33-2050 unit set 38 inches above the ground and pointing toward the nearest sound, i.e., propeller, muffler, or open-exhaust outlets. Three distances were used—3 feet, 9 feet and approximately 22 feet.
Meter settings .... "A" Scale and "Slow" response.



Manufacturer: O.S. Engines, Osaka, Japan
U.S. Distributor: Great Planes Model Distributors, 1608 Interstate Dr., Champaign, IL 61820.

SCHNEIDER CUP

(Continued from page 32)

(apparently, on final flare during the second heat), and we were out of the race! Our only solace was that we could sit back and watch the final rounds.

FROM THE BENCH

Heitcamp's Macchi M-33 and Rasmussen's Supermarine S.6B both scratched on takeoff in the third heat. The ones that remained in the air made some remarkable flights. Merril slammed his R3C-2 around the pylons for a 46, and Skogland's 1913 Deperdussin came right back with another 46. Cliff Adams thrilled the crowd with his custom, 4-stroke four-banger. The sound of his S.6B backing down before a pylon and then accelerating away was spectacular!

Despite everyone's best efforts, McInnes (the "Smiling Aussie") and his Sopwith Tabloid held on to 1st place. Merril, with PEC's Curtiss R3C-2, had pounded his way from 4th to 2nd and stood 4 points behind McInnes. Slater's Sopwith clung to 3rd place, while Skogland's Deperdussin jumped from 5th to 4th. J. Paul Lussier came from behind the pack with *another* Sopwith Tabloid to capture 5th.

The fourth heat began with three 1914 Sopwith Tabloids and a 1913 Deperdussin pitted against a 1925 Curtiss R3C-2! There was a wild card, however: after this heat, the pilots could throw away their worst score, for a final average of their three best heats.

FINAL HEAT

Ten planes were back on the line, and the flying began. Rasmussen's Supermarine S.6B and Warwick's R3C-2 scratched on takeoff. Chuck Fuller's Macchi M-33 scored a respectable 41, and Adams' S.6B hit a 47, but their Static scores kept them out of the running. Six planes were left to do "battle."

Skogland slugged it out with a score of 47, but he fell to 6th place when the other contestants' worst scores were dropped. Slater and his Sopwith Tabloid hung on for dear life and finished in 5th place. Pasqualetto's Macchi MC-72 dumped its zero in the second heat, posted a 43 in the fourth heat, and grabbed 4th place. That left McInnes's Sopwith Tabloid battling it out with Team Macchi's M-67 and Merril's R3C-2. McInnes put in a fine flight for a 43, but the best it could get him was 3rd place. Team Macchi, who had zeroed out in the first heat, came back

SCHNEIDER CUP

with a blistering 49 out of 50 points—the best flight score of the meet—but in the end they, too, were beaten by Merril's Curtiss R3C-2 (the same type of plane that sped Jimmy Doolittle to victory in 1925!) Merril's flying style was so aggressive that it was hard to believe the Curtiss would stay in one piece. During each pylon turn, it was millimeters away from a snap, and the big Sachs-Dolmar powerplant looked as if it were stretching the fuselage on the straightaways!

All the pilots got at a "big hand" on landing. It was thrilling to see these magnificent giant-scale seaplanes idling through the swells and returning to shore to end the 1990 race. The pilots, teams and spectators left the beach and quickly assembled in the convention center. Bob Martin couldn't stop smiling. He introduced AMA Vice President Regg Keyawa, who praised the Desert Hawks for the incredible job they did staging this fantastic event. Bob began the awards ceremony, working his way from last place to first with a short commentary about each contestant. Then it was over for another year.

In a report such as this, there's always a time when you thank the host club for their efforts. Expressing the gratitude of all who attended is an impossible task. After the '89 race, the Schneider Cup Giant Scale Re-enactment gained a reputation as one of the top five scale events in the U.S. In 1990, nothing had changed (except for the improvements and experience gained); so, from all of us to all of you...thank you! This event is a hallmark in the history of model aviation, and we're in your debt. ■

ENGINE EVALUATION

(Continued from page 91)

crisper OPS pipe used in Test 3. To compensate for this, the Cook pipe exhibited a useful wide-band performance during the tests.

Test 3. OPS 90 pipe (unmuffled Marine 90; pipe part no. 5270). Fuel and plug as in Test 1.

I ran this test because my previous findings indicated that pipe volume can affect power considerably: a volume that's too small in relation to engine capacity leads to almost as much exhaust throttling

(Continued on page 94)

ENGINE EVALUATION

(Continued from page 93)

as a standard back-pressure muffler—and with an almost similar depressing effect on power. Apparently, the resonance effect is swamped by the inability of the exhaust to exit fast enough in this extreme case.

Hoping to achieve the same 22,000rpm resonance point, I decided to install a "full-volume," 260mm (from plug to first maximum diameter) Marine 90 pipe. Up to 19,000rpm, power was slightly less than that of the Cook pipe, but when final full resonance was reached, the power increase was significant.

As expected, noise also increased—I estimate the increase to be 1 1/2 to 2 decibels. The rise to maximum power and the eventual sharp drop past 22,000rpm confirmed the somewhat "peaky" nature of this pipe's performance. Nevertheless, dynamometer readings suggest that, in a typical aircraft, its use would lead to stable, predictable engine performance.

For comparison, the parameters of the two pipes used are shown in the chart. I was surprised that this level of performance was reached on quite mild fuel with "soft" engine design features, but perhaps I should be grateful because, as it was, the O.S. .91 VR proved to be a daunting spectacle during tests. (Power flow throughout was rock-steady and quickly responsive to throttle.)

IDLING

Using the low-inertia Dynamax fan (without a shroud), the Cook pipe and the test fuel and plug allowed an idling speed of 3,200rpm. For slower idling, propellers with much larger diameters and, thus, higher inertia, are needed—and there's a shortage of suitable propellers for such a devastating performer!

dB SOUND TESTS

For these, I again used the Dynamax fan and Cook pipe. For convenience when using the dynamometer, I left off the static shroud, so my recorded dB levels are probably slightly higher than you'd expect from a real model in which the fan and engine would be buried inside.

SUMMARY

O.S. has taken a chance with the .91's unique high power-to-weight ratio of 3.41 BHP/pound, but good design and engineering ensured that the engine sailed through my relatively short tests without

(Continued on page 101)

HELICOPTER SECTION

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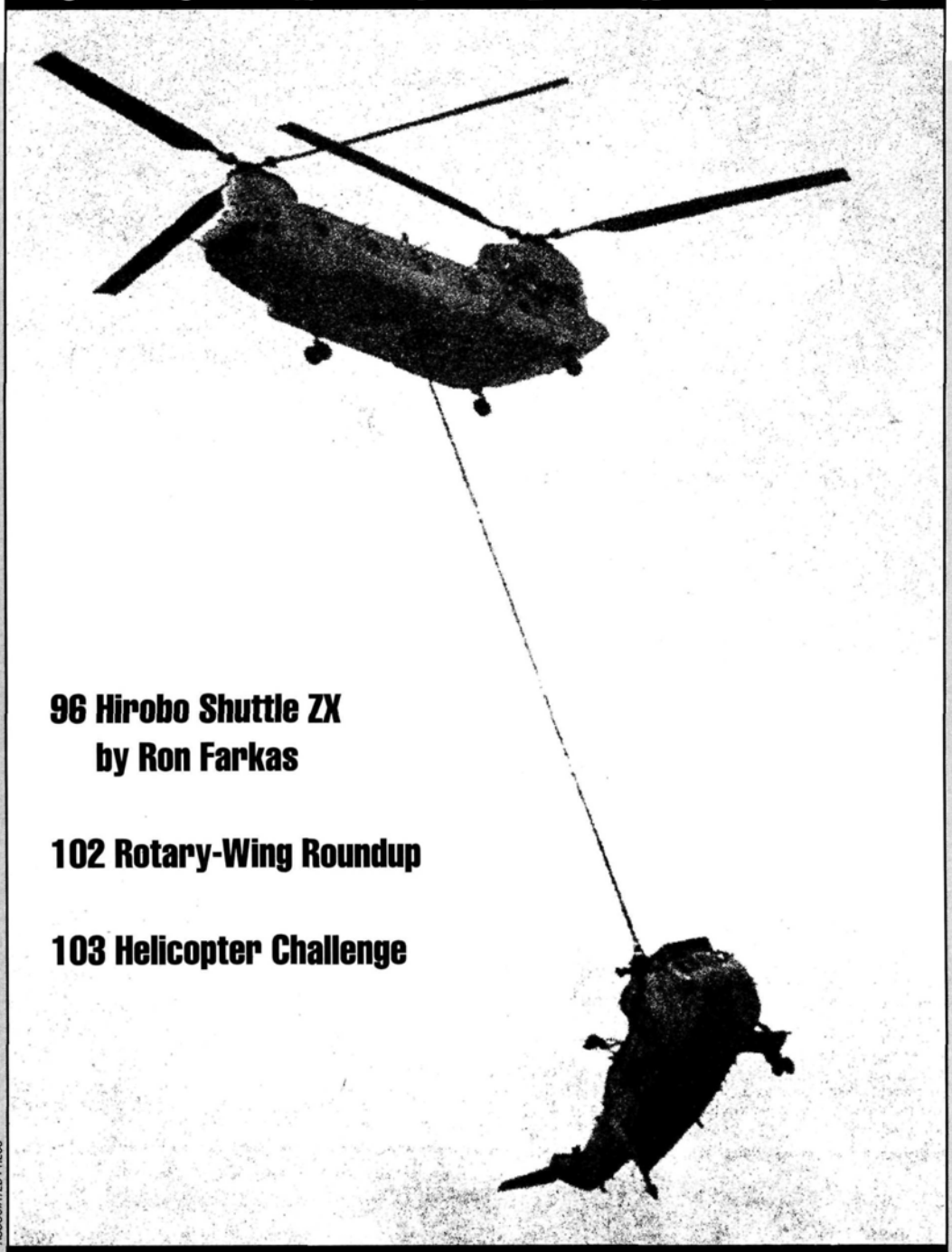


96 Hirobo Shuttle ZX
by Ron Farkas

102 Rotary-Wing Roundup

103 Helicopter Challenge

ASSOCIATED PRESS

In this issue, see our "Pad & Bench Review" of the ARF version of the Hirobo Shuttle ZX—a machine with a notable range of performance capabilities. In "Heli Challenge," Craig Hath explores the basics of autorotation .

Photo above: A U.S. CH-47 military helicopter lifts a damaged British Sea King heli from the Saudi desert. The Sea King was damaged while making an emergency landing.

PAD & BENCH REVIEW

Easy set-up with novice through expert capabilities

by RON FARKAS

THE HIROBO SHUTTLE ZX is the latest high-performance model in a long line of Shuttles. Although new helicopter enthusiasts might not have appreciated it, the original Shuttle was very innovative. When it was introduced five years ago, it was the first new .30-size machine in years. Hirobo used composite plastic extensively in its frame and rotor head, and its collective-pitch head was a smaller version of the company's competitive dual-damping/flapping design. Its tail rotor was driven by a toothed belt; its servo trays were of plastic; and its canopy could be slid into place. In addition, you could buy an almost-ready-to-fly (ARF) version. The Shuttle still has several of these features, some of which

"The Shuttle ZX is a good choice for both novice and experienced pilots."

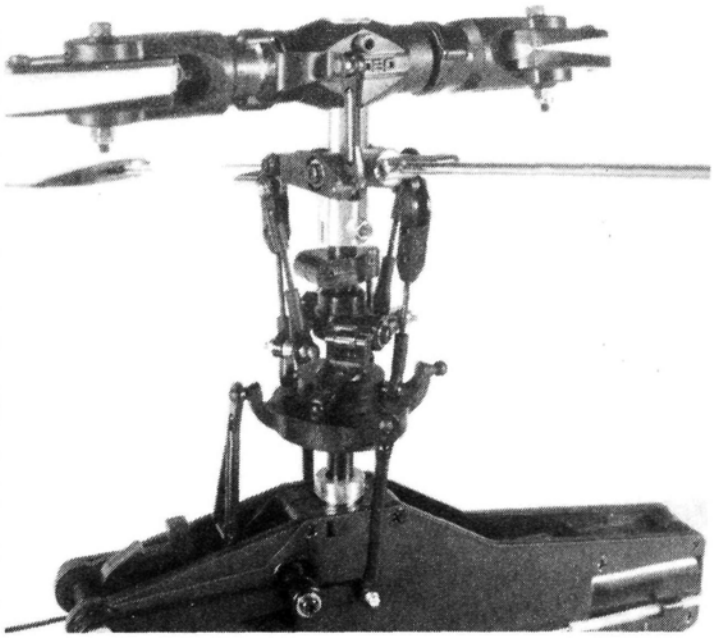
have been adopted by other manufacturers.

The .30-size helicopters are popular with beginners because the initial cost is relatively low, they're easy to assemble and they have relatively docile flight characteristics. Experienced fliers use these economical high-performance machines for contest practice and "hot-dog" flying.

HIROBO shuttle ZX

Because they fulfill so many needs, product development and sales of .30-size helicopters have been increasing, and several manufacturers have introduced new ones.

Hirobo Shuttles are imported and distributed by Altech Marketing*, which also distributes Enya engines, so it's not surprising that the ARF version of the ZX includes an Enya .35 heli engine. Altech is fully committed to the sales and support of Hirobo helicopters and has hired well-known expert Mike Mas for technical and marketing advice.



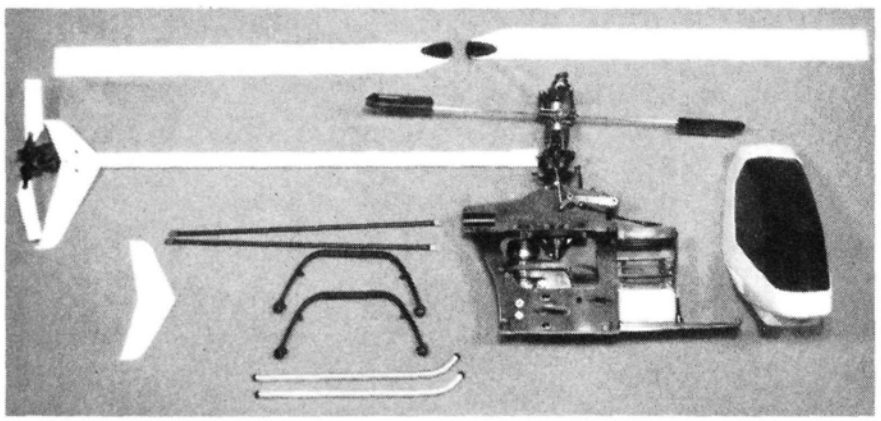
The new FZ rotor head features an underslung flybar and updated mixing linkages.

IMPROVEMENTS

Several improvements have been made to the Shuttle since its introduction. The original DDF rotor head has been replaced by one with a more rigid blade attachment, and this is still available on the Shuttle XX model (not the model reviewed). The changes introduced on the Z and ZX models accommodate the needs of advanced fliers and include the new FZ rotor head with an underslung flybar, an upgraded washout mixing unit, a longer rotor and a longer tail boom. The rotor head is of mostly composite construction. Its new solid-steel feathering axle is supported by rubber O-ring dampers, although two radial ball bearings are still used in the main-rotor blade holders. The underslung flybar reduces the rotor head's overall height, and this should result in reduced play in the linkage.

Other new features include weighted blades, CG-corrected paddles and a more precise tail-rotor pitch-control slider mechanism. The tail-blade holders still use a single thrust-bearing arrangement. To ensure smoother operation of the collective/cyclic mixing levers, 20 more ball bearings are used on the ZX, as are a metal clutch, a longer landing gear and tail-boom support braces.

The Shuttle's performance ranges from mild to wild, depending on how it's set up. Even with all its fancy features, the ZX is an ideal "first" helicopter if it's adjusted according to the minimum control throws given in the instructions. The ARF version (reviewed in this article) is so easy to assemble and set up that first-time builders will quickly have an airworthy machine. For more experienced fliers, aerobatic settings are also given, and the ZX already has the most desirable high-performance upgrades.



The kit's mechanics are finished and the boom with tail rotor is already installed.

ASSEMBLY

To assemble the ARF ZX Shuttle (which has an engine), you only have to install the tail boom, the landing gear and the radio; attach the horizontal fin and boom braces; connect the tail-rotor pushrod; bolt on the main blades; and apply the decals. It's that simple! An Enya .35 TN engine with a heat sink and all the linkages (from the swash plate to the rotor head) are factory-installed, and the linkages are set to the correct lengths. Even most of the pushrods are installed, although you might have to adjust them slightly, depending on which servos you use.

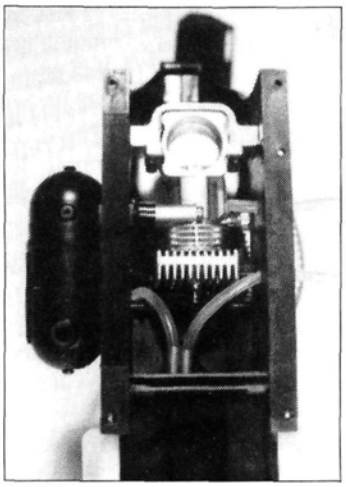
It took me 1 hour to assemble everything; 1 hour to install the radio; 2 hours to hook up and adjust the controls; and half an hour to apply the decals. For first-time helicopter builders, this is definitely the way to go. Ambitious modelers can save some money by buying the full kit and a .28 to .35-size engine separately. (Note: Hirobo Shuttles are set up for

SPECIFICATIONS

Type: .30 sport helicopter
Rotor Diameter: 49 inches
Length: 42 inches
Weight: 5 pounds, 3 ounces
Power Req'd: .28 to.35ci
No. of Channels Req'd: 4 (conventional) or 5 (helicopter system)
Sug. Retail Price: $550 (as reviewed)
Features: Made mostly of composite plastic, this ARF version is almost completely assembled and has a factory-installed Enya .35 engine, full collective pitch and a high-performance rotor-head system. The Shuttle is also available without an engine (assembled, $420; in a kit, $370).
Comments: The Shuttle ZX is a good choice for both novice and experienced pilots. It's very easy to set up for training, yet it has aerobatic potential, too. Its many new features bring it up to the standards of the latest technology.

use with Enya engines.)

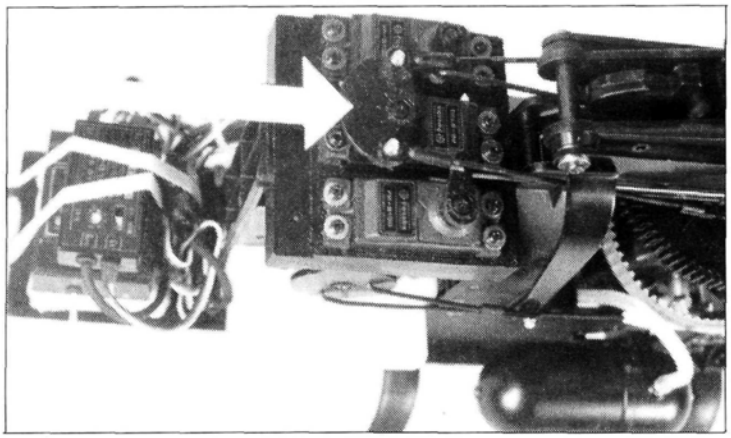
Become thoroughly familiar with the instructions. A couple of steps in the well-illustrated instruction booklet might puzzle a newcomer. For example, to install the tail drive belt, you have to remove and then replace the pulley flange. You might misunderstand the description of how the pitch (elevator) servo should rotate. If you interpret a stick direction that's labeled "down" as "back-stick" (not "down elevator"), then the rotation is correctly identified as clockwise. Also, instruction no. 1 on page 15 refers to servo-wheel illustrations that are on pages 18 to 21.



An Enya .35 TN helicopter engine with a Hirobo muffler is factory installed.

SHUTTLE SETUP

Although the ZX is the most advanced version, the Shuttle line is primarily designed for newcomers to R/C helicopter flying. The instruction booklet shows how to install both four-and five-servo radios, and it even suggests that beginners use a 4-channel airplane radio. To do this, you'd have to use the dual-pushrod output from the throttle servo to both the carburetor and the rotor-head collective-pitch mechanism. Unlike helicopter radios, 4-channel airplane radios don't have electronic tail-rotor compensation. Both four- and five-servo arrangements use a rate gyro on the tail-rotor control, so the absence of compensation isn't a big deal when you're learning to hover.



The arrow shows the dual-output, roll-cyclic (aileron) servo wheel, which provides a slop-free linkage.

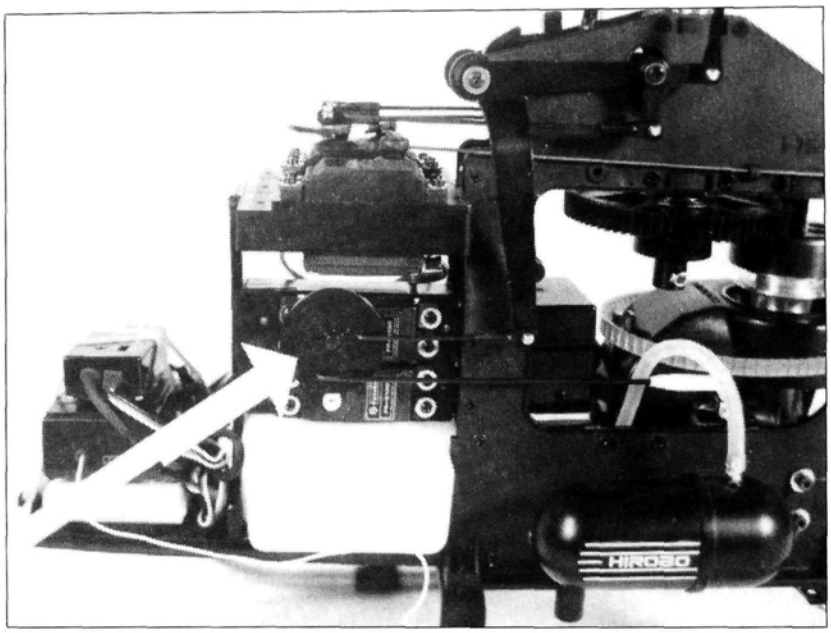
Usually, I recommend that beginners use helicopter radios, but to do a completely fair review, I initially set up my Shuttle with four servos, and I turned off all the helicopter features on my Futaba* 7-FGHI transmitter. (This radio is no longer in production, but it's representative of middle-of-the-road systems.) I was interested to see whether these limitations would make it difficult to trim for hover and forward flight. At first, the tail rotor was way out of trim (the machine would have spun around on a beginner), but I was able to hover immediately. The cyclic and collective controls were just about right, and even the engine needle-valve setting was suitable for hovering. I was really impressed.

I didn't like the way in which the tail pushrod is attached to the control lever with a setscrew. It took a number of tries to find the proper trim adjustment; whenever I loosened the screw, I lost the reference point! An adjustable ball clevis would be a welcome addition. During the trimming process, I also had a problem with the tail-rotor pitch-control mechanism. The new sliding collar and linkage produces a greater pitch change for a given amount of servo throw, and it's possible for the blade holders to travel over-center and jam with full-right stick. To solve this, I moved the Z-bend end of the pushrod closer to the servo-arm pivot to reduce the throw. The resulting control authority is even enough for aerobatics, and you can reduce it further by using the transmitter dual-rate for training purposes.

PERFORMANCE

After a brief hovering session using about two tanks of fuel, I started to fly circuits. The Shuttle behaved gently and predictably—perfect for novices or intermediate fliers. Though it would be a while before you'd use the full range of power and control throws, I pushed the machine to see how it would handle an aggressive flying technique. In fast forward flight, the engine

(Continued on page 101)



The servo wheel (shown by the arrow) operates both throttle and collective pitch.

ENGINE EVALUATION

(Continued from page 94)

any problems. It's likely that this fine racing engine will follow its impressive entry into the world of ducted-fan scale aircraft with even greater success.

**Here are the addresses of the companies mentioned in this article:*
O.S./Great Planes Model Distributors, *1608 Intersate Dr., Champaign, IL 61820.*
Dynamax; *distributed by Jet Model Products, 304 Silvertop, Raymore, MO 64083.* ■

SHUTTLE ZX

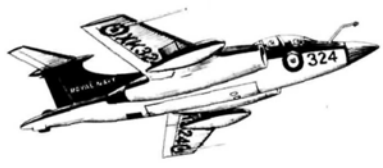
(Continued from page 100)

unloaded a little, indicating that it could handle an additional degree or so of high-end collective pitch. Its straight-line tracking was good, but it could have benefited from automatic tail-rotor compensation to keep the boom more in line with the direction of flight. Otherwise, the factory settings and the simple four-servo radio setup were satisfactory for both training and sport flying.

I hooked the fifth servo to the engine throttle, rearranged the servo plugs and activated the helicopter mixing functions for the throttle, collective pitch and tail rotor. I also increased the total collective-pitch range and the other control throws. The machine was faster and more maneuverable, yet still very stable and predictable. Loops, rolls, stall turns and five-forties were easily accomplished. The longer weighted blades seemed to be just the ticket for accurate autorotation landings. The recent Shuttle ZX contest record and reports of Mike Mas' demo flights indicate that it has all the potential experienced helicopter pilots require.

Hirobo has incorporated improvements that bring the Shuttle ZX up to the latest technical standards without compromising the needs of novices. Its convenient size, attractive price and low operating cost will appeal to a variety of fliers. These factors, coupled with Altech's reputation for customer support, make the Shuttle ZX a very good choice.

**Here are the addresses of the companies mentioned in this article:*
Altech Marketing, *P.O. Box 391, Edison, NJ 08818.*
Futaba Corporation of America, *4 Studebaker, Irvine, CA 92718.* ■



ROTARY-WING ROUNDUP

GREAT PLANES
Kyosho Concept 60

Kyosho's new Concept 60 helicopter is expected to be as popular in the .60-size heli class as the Concept 30 is in its class. This 8.8-pound heli has a main-rotor span of 59.84 inches and a tail-rotor span of 10.23 inches. Its features include: a gear ratio of 9.79:1:5.38 (subject to modification); a wire-type tail drive; laminated-wood, weighted blades; and a 16.5-ounce fuel tank. The innovative Concept 60 was designed by Shigetada Taya, and it has pure, precise flying qualities. Fliers can expect the same support that comes with the 30, including a monthly newsletter!

Part no. KYOE0290. *Price: $999.95*

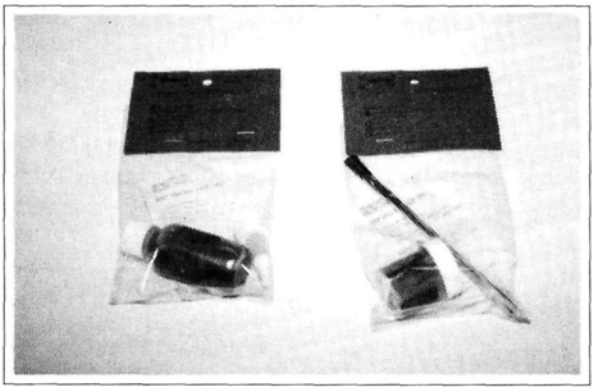
For more information, contact Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61824.

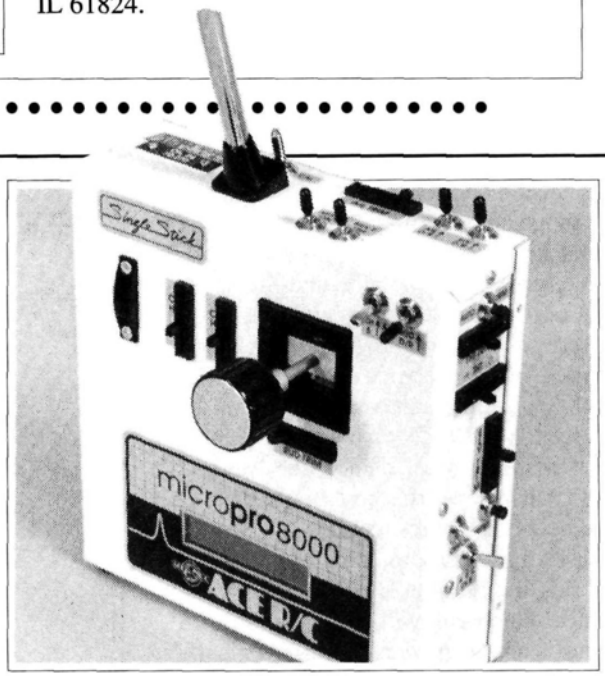
AERO-CAR TECHNOLOGY
Diff/Gear and Bearing Lube

Super Speed Differential and Gear Lube is the best lubricant available for the main gear and bevel gears, and it repels dirt and moisture. Bearing Lube protects swash plates, yoke bearings and ball joints. These superior lubricants are environmentally safe, and they won't harm skin or eyes. Further, they won't damage plastic, nylon, polycarbonate, or fiberglass parts. Be safe; use Aero-Car non-toxic lubes.

Part nos. AC1001 (Super Speed Differential and Gear Lube); AC2002 (Bearing Lube). *Prices: $5.99* (1/2 ounce); *$5.99* (1 ounce).

For more information, contact Aero-Car Technology, Inc., P.O. Box 336, Western Springs, IL 60558. (Distributed by Great Planes Model Distributors.)





ACE R/C
Micropro 8000

Ace R/C's Micropro 8000 is a microprocessor-driven, 8-channel transmitter. It has eight-aircraft memory, auto-trim, universal mixing and a logical layout. This transmitter can be used for all flying applications for both helicopters and fixed-wing aircraft. Set-up is a snap with the menu-driven display, and it's programmed and built by Americans, so it's easy to understand. It's available on all legal frequencies.

Price: $395

For more information, contact Ace R/C, 116 W. 19th St., P.O. Box 511, Higginsville, MO 64037.

Helicopter Challenge

Autorotation!

by CRAIG HATH

DURING THE PAST few months, I've made suggestions on selecting your first model as well as building, trimming, fine-tuning *and* flying it. Now I'll guide you through basic aerobatics and some of the more advanced aspects of helicopter flight, such as autorotation and nose-on hovering.

Pilot Bob Pickens starts the flare by pulling back on the cyclic stick to bleed off excess forward air speed.

AUTOROTATION PRIMER

Successful autorotation landings can save you a lot of grief (and cash!) if an unexpected flame-out occurs. (Pilots of full-size helicopters must learn to do them before they can fly solo.) Although autorotation landings are among the riskiest maneuvers to learn (most of the critical work is done near the ground), many fliers find them enjoyable and extremely challenging—a definite bonus.

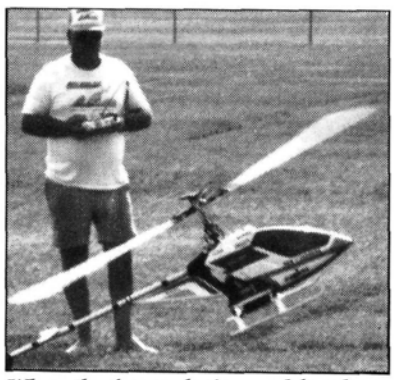
To be successful, you must fully understand what's happening to your helicopter every minute and be able to respond correctly, or you'll crash it. Before you begin, make sure that you understand and are capable of performing all aspects of forward flight, especially the transition from forward flight into hover. (I discussed it in this column a few months ago, and you might want to bone-up on it.) You'll also have to prepare your helicopter.

AUTOROTATION "MUST-HAVES"

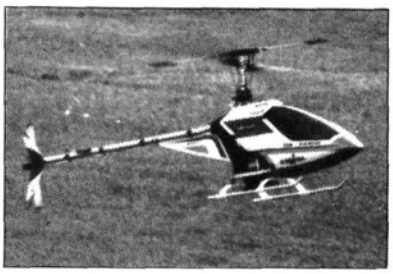
These are necessities for "autos": a collective-pitch helicopter with an autorotation clutch; a radio system with a throttle-hold switch and circuitry; and tip-weighted rotor blades.

It's impossible to autorotate a fixed-pitch helicopter because there's no way to reverse the rotor blades' angle of attack and convert the energy of a falling helicopter into rotor speed. In addition, a fixed-pitch heli uses all of its blade energy shortly after its engine stops. This means there's no energy left over to create the lift that's necessary to break a fall at the bottom of an auto.

On a collective-pitch helicopter, however, you can change the rotor blades' pitch. When the engine stops, you quickly reduce the main rotor's angle of attack to slightly negative pitch. Air rushing through the falling helicopter's rotor disc then enables the main rotor to continue to spin at the same or even greater speed. As you flare out the heli, the pitch increases and the rotor disc's spinning energy is traded for lift, which smoothly breaks the fall before you land.



When the forward air speed has been bled off, the heli is about 5 feet off the deck and is ready for the forward cyclic command.



Forward cyclic pushes the heli's nose down to a level attitude and smooths the touchdown.

An autorotation clutch prevents the engine from dragging the rotor speed down to the speed of clutch disengagement when the engine is shut down. Without an autorotation clutch, the main rotor becomes so slow that rotor speed can't be recovered; it continues to decrease, and the helicopter crashes.

A throttle-hold switch (included on most helicopter radios) allows the engine to be set for a dependable idle speed below clutch engagement, while collective pitch is operated independently of the throttle. In other words, the throttle is held in the idle position while the collective-pitch/throttle-control stick operates collective normally. Keeping the idle speed below the clutch-engagement speed stops the tail rotor, and this reduces the heli's tendency to turn during flares and landings. Stopping the tail rotor during autorotation also reduces friction in the main-rotor system.

The final "must haves" are tip-weighted main-rotor blades. You should enhance the inertial effect of

(Continued on page 104)

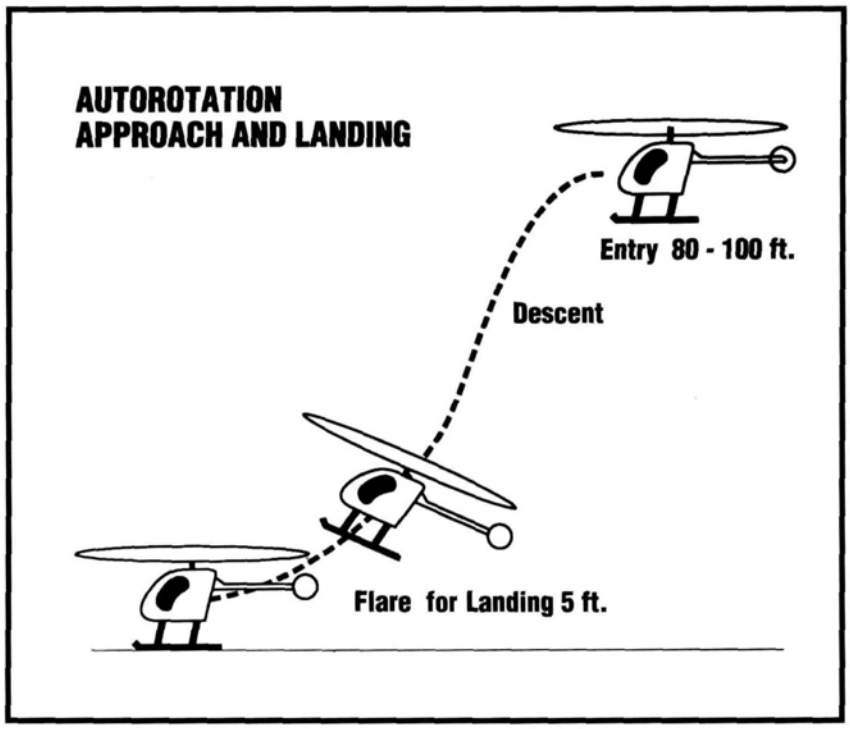
(Continued from page 103)

a spinning rotor disc. If the rotor blades' weight is concentrated at their tips, the main-rotor speed will decrease much more slowly when you increase the rotor blades' angle of attack during a landing. The amount of tip weight depends on the size of the machine and the type of rotor head. Most .60-size helicopters need about 25 grams in each tip while smaller, .30-size machines only need 10 to 12 grams.

Remember: the heavier the blades, the greater the load on the main rotor and the blade grips. This increases the chance of structural failure. The main-rotor grips on most .60-size machines have thrust bearings that help carry the extra load, but they can only handle so much. In addition, heavier blades will slow cyclic-pitch responses and make the helicopter more difficult to maneuver. (Rotor blades will be the subject of a future article, so be on the lookout for it.) For now, buy a good set of "weighted" rotor blades, and carefully follow the instructions on their construction and use. There are also some excellent "pre-built" rotor blades available.

The general setup for autorotations depends on your helicopter and radio system. For smooth full-down autos, the typical collective-pitch range is from 2 to 4 degrees of negative pitch (low) to about 11 to 13 degrees of positive pitch (high). After you've made a test flight, you'll be able to adjust these figures to suit your helicopter and your personal preferences. If your radio only has one pitch-curve adjustment, you'll have to set up for all kinds of flying. You might have to reduce the top-end pitch slightly. This could prevent you from performing forward flight at wide-open throttle/collective stick, because the higher pitch required for autos will overload the engine. If this is the case, simply do your up-and-about flying at three-quarter throttle, and be careful not to overload the engine.

If your helicopter radio has a separate pitch-curve adjustment for autorotations, be sure that the system is in the throttle-hold mode when you set the autorotation pitch. On my setups, the high-pitch value is about what I need for autos, and I vary the low pitch according to my flying style.



YOUR FIRST AUTOS

At the field, set the throttle-hold so that the engine idles dependably. Just make sure that the throttle-hold doesn't kill the engine, because you want to be able to abort the auto if there's a problem.

Get the helicopter up into slow forward flight at an altitude of 80 to 100 feet. Bring its nose around into the wind about 10 or 20 yards downwind of your position. As the helicopter approaches, smoothly move the collective/throttle stick to full low. Hit the throttle-hold switch and let the helicopter descend for a few seconds. Then hit the hold switch again, and fly smoothly out of the descent.

For the first few attempts, watch the helicopter to determine its rate of descent. If it descends too quickly, increase the pitch slightly. You want a pitch setting that enables the helicopter to glide down at a controllable rate—not race down or, conversely, float down. Keep the heli's nose level during the descent, and use its attitude to control the forward air speed. Dropping the nose too much increases the air speed, which will be difficult to bleed off in the flare. Ideally, you should make an approach at a fairly steep angle with moderate forward air speed.

When you've adjusted the pitch for the best rate of descent, practice a few approaches. Again, start at 80 to 100 feet, move the throttle stick to full low, hit the hold switch and let the helicopter drop. When the helicopter has descended to about 15 feet, pull back on the cyclic to stop its forward motion. Turn off the hold switch and open the throttle *smoothly* so that the helicopter moves into hover. These are called "power recoveries," and they're a good way to warm up for autorotations. When practicing power recoveries, you have to apply the

throttle/collective pitch quickly so that the helicopter flares out and stops descending in about 3 feet. Practice power recoveries until you feel comfortable operating the throttle-hold switch and stopping descents.

FULL-DOWN FLARE AND AUTOROTATION LANDING

It's time to shoot the first full-down landings! You'll be letting the helicopter descend to about 5 feet before you begin the flare, so mentally prepare yourself for it. Begin your descent as before. When the helicopter has dropped to 5 feet, start pulling back on the cyclic to get the nose up and bleed off any forward air speed. If the heli has built up a lot forward speed, you might have to pull back on the stick quite sharply, so be prepared. Increasing the cyclic pitch also slightly increases rotor speed. As the helicopter descends, feed in collective pitch to push the nose level and bring the helicopter to a smooth touchdown.

The amount of collective pitch you need depends on the helicopter, its rate of descent, weather conditions and the remaining forward air speed. Some machines need almost everything to make a good landing, but others come in and down at just half stick, or so. Just don't use too much pitch because it will cause the nose to twist around when it touches the ground. If your machine twists around at the bottom of an auto, slightly reduce the top-end pitch until it stops twisting. You might not be able to eliminate all the twisting action owing to main-shaft bearing drag, so you'll have to experiment. Miniature Aircraft* and Kalt* offer main-shaft bearing kits that reduce drag on many of their models.

For the best results, experiment with pitch curves, approaches and rotor blades. The secret to good autos is practice, practice, practice. See ya next month...!

**Here are the addresses of the companies mentioned in this article:*
***Miniature Aircraft USA,** 2324 N. Orange Blossom Trail, Orlando, FL 32804.*
***Kalt;** distributed by Hobby Dynamics Distributors, P.O. Box 3726, Champaign, IL 61826.* ■

AIRWAVES

(Continued from page 11)

from BV Competition Engines (rpm reported in the high 30,000 to 40,000 range), we expect increased interest in 1/2A-size fan jets. If we hear from anyone who offers a unit in this size, we'll let you know. TA

PLANS APPLAUSE

Thanks for publishing the Plans Directory in the December '90 issue! It was a very thoughtful Christmas present, and I've already made use of it.

On December 5, I ordered a two-sheet plans set from the service, and UPS delivered it in a mailing tube on December 14—that's quick service! To my dismay, one of the sheets was missing. I called the

(Continued on page 108)

AIRWAVES

(Continued from page 107)

service office, and a very helpful lady checked on the order and assured me that the problem would be corrected. And it was! UPS brought the replacement sheets yesterday—shipped second-day air! I've ordered plans from other sources and, with them, the *first* installment wouldn't even be here yet!

As a 10-year subscriber, I've recommended *MAN* to others as the "best of the bunch." Because of my recent experiences, my opinion has been confirmed. You have a superior editorial product and a superior service staff and organization to back it up. (I'll tell anybody who asks.)

BENJAMIN W. HARTLEY
Jaffrey, NH

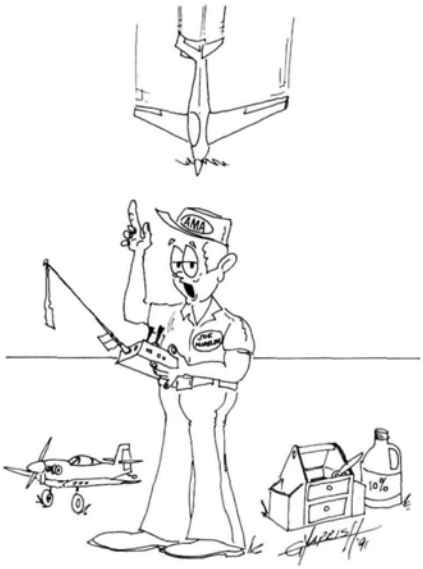
Benjamin, we appreciate your comments (especially the hard-working crew in our plans service department, where we've posted your letter). Thanks. TA

HOBBY HINDENBURG

I would appreciate any assistance you can provide in locating shops or individuals who carry models and/or information about building R/C models of dirigibles and blimps.

CHARLES MEIHART
Delmar, NY

Charles, try contacting Peck Polymers, P.O. Box 2498, La Mesa, CA 92044. They've been providing R/C blimps for years. Any other providers in our readership? TA



"Now, what were those insurance changes?"

AIRWAVES

SHOW THE PLANS!

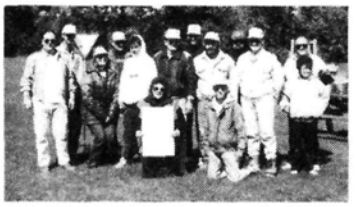
I've been very disappointed with your magazine lately. I really enjoy most of the articles, especially those on construction. I try to read each one to learn about new products and construction methods. I'm disappointed because you don't include the wing plans, and you obscure portions of the plans so that I can't see how the plane is constructed. I suppose you started printing plans in this way to avoid having them reproduced and blown up to full size on copy machines. I can sympathize, but I think most modelers would rather buy full-size plans. I hope this flaw won't cause me to cancel my subscription.

THOMAS ATKINS
Suffolk, VA

Tom, we've received a slew of complaints about covering portions of, or "overleafing" plans in our construction articles. I agree! We'll show the full plans from now on! TA

(Continued on page 111)

(Continued from page 109)



PRIZES FOR FUN FLYS

Our club would like to thank you for donating magazines to our Annual R/C Combat Event. They were a big hit at the field. I made sure that all the contestants and staff (the unsung heroes) received copies, and the extras were given to spectators. Without your help, we wouldn't have been able to give all the participating pilots something back for their money. Enclosed is a picture of the MAC club to express our appreciation. The poster in the photo lists all the people who donated gifts. Again, a great, big thanks!

DEBRA JUSTICE
Bensenville, IL

We're glad you enjoyed the magazines, Debra. We're happy to donate gifts (magazines and six-month subscriptions) to aeromodeling competitions and fun flys, although we can't do it for all the events held each year! Clubs that would like to receive gifts for events should send requests to the attention of Ann Matregrano, c/o Model Airplane News, 251 Danbury Rd., Wilton, CT, 06897. Requests must be received at least six weeks in advance of the event and must include the following: the event's name; the date on which it will be held; the approximate number of attendees; and where to send the donations. TA

EAGER TO FLY

I'm 13 years old and have been interested in R/C airplanes for about five years. I fly a Senior Telemaster, and I love it (I like big planes). I recommend it to anyone who wants to get started in this totally awesome hobby. Although I don't have my "wings" yet, I know what my next project will be. I plan to buy a Super Chipmunk, and I'm going to give it flaps and a K&B .65 Sportster engine. When I finish it, I'll send in some photos for "Pilots' Projects." I'm very excited, and I hope I get a crack at this project soon.

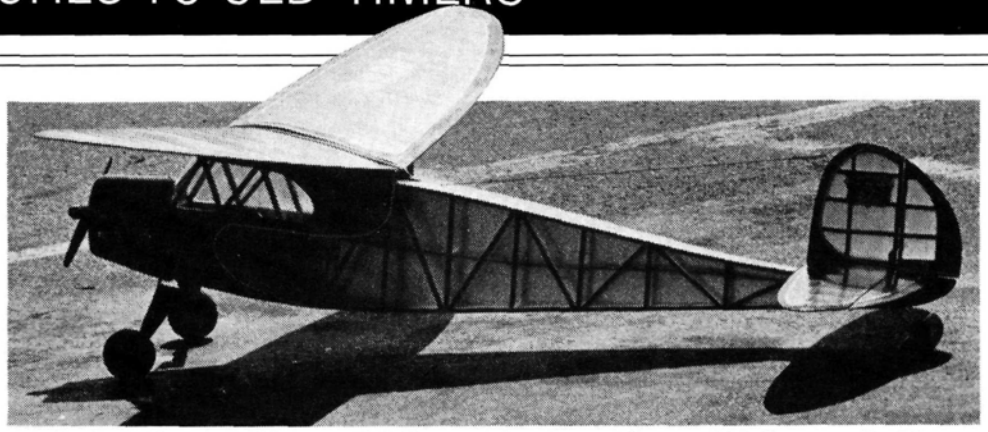
PAT HIMES
Dayton, OH

(Continued on page 124)

SMALL STEPS

NEW APPROACHES TO OLD-TIMERS

by JOE WAGNER



Here's another great old-timer: Al Hellman's 6-foot Comet Clipper, which flies as well with a modern .20 as the prewar original did with a .60—and at the same weight!

DO YOU WANT to try something new in a small R/C model airplane? If so, why not try something old?! Just as full-size antique cars and planes often have more "personality" than modern ones, many of yesteryear's model airplane designs are more appeal ing than today's typical Trainer 40—and they fly well, too!

OLD OPTIONS, NEW IDEAS!

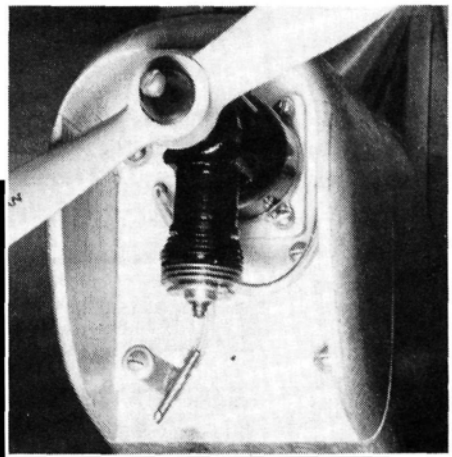
One approach to old-time R/C flying with small engines is to scale down the size of the typical 6-foot-and-up, free-flight designs. Two examples of this are Midway's* 50-inch-span kit of Sal Taibi's 7-foot Powerhouse, and Flyline's* Quaker Flash which, with a 34-inch wingspan, is half the size of the 1938 version.

Today's glow and diesel engines, however, produce far more power for their displacement than the spark-ignition engines for which old-timer gas models were designed. Because they don't need heavy coils, condensers, wiring, or batteries, modern powerplants are lighter, too. This makes it practical to build original-size old-timer models and fly them using small engines. The 1937 Cleveland* Cloudster was designed for a Syncro Bee .147, but I power mine with a Cox* .049. Even with a 3-channel radio, it weighs less and performs better than the prewar model ever did!

My friend Al Hellman also builds and flies original-size R/C prewar free-flight airplanes, and I especially like his 6-foot Comet Clipper Mk. I. Half a century ago, this was Carl Goldberg's* *first* kitted model! Al's Clipper looks just like Carl's, and it weighs the same and performs as well. Instead of the O&R .60 that Carl used, however, it has a glow .20 in its nose. The Clipper flies as gently as any trainer, glides like a 2-meter sailplane and, when the sun shines through its covering during flight, it's a joy to behold!

THE ORIGINALS

Ben Buckle, a British company, makes several original-size kits of old-timer model airplanes (e.g., the Berkeley Buccaneer Standard, the Scientific Red Zephyr, the Megow Quaker Flash and the Trenton Terror), and you can fly all of them using a .20 or .25 for power. (Both Tower Hobbies*

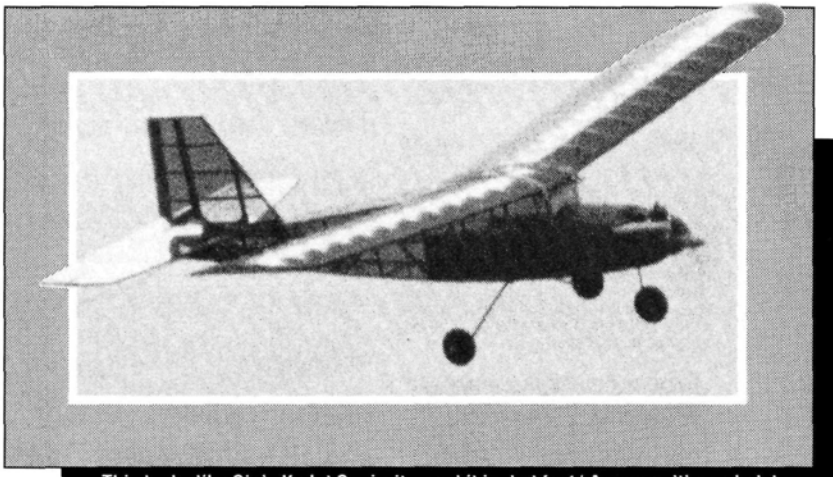


Inverted motors run just as reliably as uprights. If you prime while the piston covers the exhaust ports, they start easily, too.

INVERTED ENGINES

I prefer inverted installations for my 1/2A engines (they make for neat-looking fuselage noses!), and I'm often asked if I have trouble starting them. I don't, but I understand why people ask that question.

You can't choke reed-valve Cox engines. To start them, you have to prime them through their exhaust ports. With a Cox engine in the inverted position, squirting fuel into the exhaust will definitely drown the glow plug if the port is open, so I simply cover it with the piston. Most of the prime harmlessly drips off, yet there's just enough fuel alongside the piston to start the engine. With one or two snappy flips, my "upside-down" engines do their stuff just as powerfully and reliably as they would in the upright or "sidewinder" positions!



This looks like Sig's Kadet Seniorita, and it is, but for 1/2A power, it's scaled down to 60 percent of its original size. It's ideal for schoolyard R/C.

MODERN "MINIATURES"?

Old-timer model airplanes aren't the only types that can be scaled down and flown using small engines. Recently, I've seen several examples of modern R/C planes that have been downsized. Sig Manufacturing's* big R/C kits seem especially popular for this treatment, perhaps because the plans for most of them are available separately.

With copy machines everywhere these days, downsizing is easy. Although reducing a 6-foot Sig Ryan STA Special to a 42-inch-span plane is a piecemeal project, all you need are a stack of quarters (to feed the machine) and some tape to attach the sheets. (That's much easier than working with dividers, a T-square and French curves!)

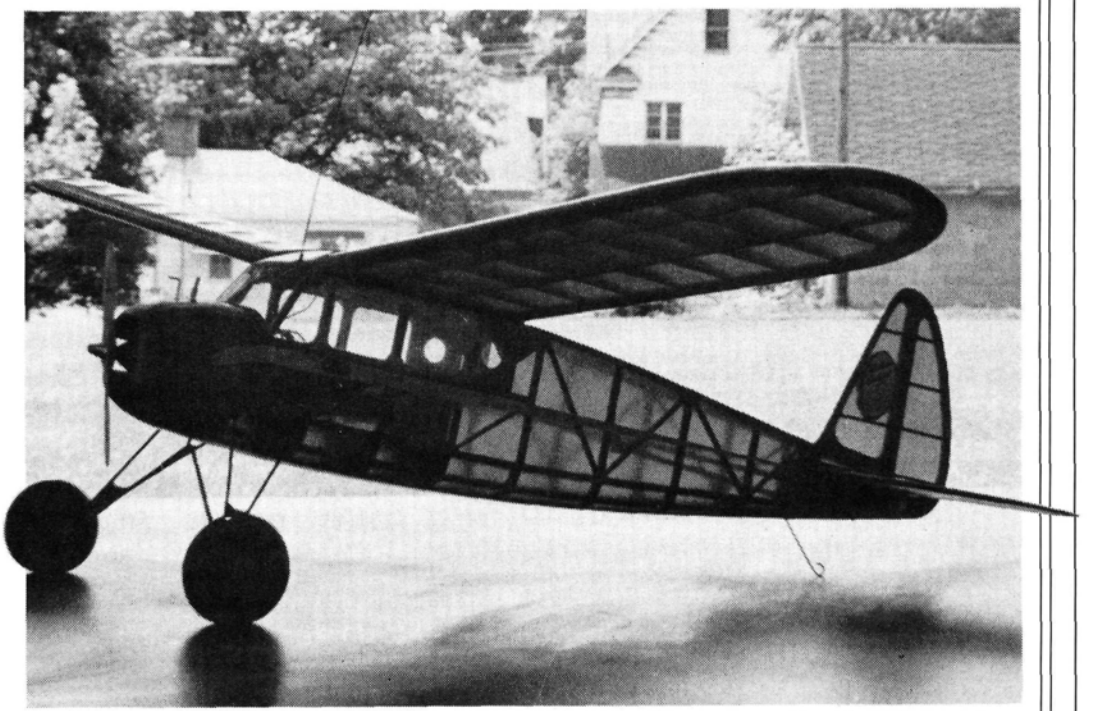
Recently, noted West Coast electric-R/C pilot Tony Naccarato showed me his beautifully built miniaturized Sig Seniorita. Powered by a Cox Queen Bee, this 40-inch, 3-channel, school-yard flyer flew so sweetly that I wouldn't be surprised to see it listed in Sig's next catalogue. (Are you paying attention, Maxey?)

and Midway carry these kits.)

For scratch-builders, *the* source of old-time model drawings is John Pond's Old-Time Plan Service*. He has just about every model airplane design ever published in a magazine or issued as a kit! If you want an off-the-beaten-track small R/C project, John sells plans for the Peerless Rocket, the Megow Cadet and Cardinal, the Berkeley Buccaneer 36, the Cleveland Fleetster (a "toughie" to build, but it's a real beauty!), the Stanzel Texas Ranger and Frank Ehling's GE Cabinette—to name just a few! (If you've built and flown any of these little-known designs, please send me photos!)

So, as I said, if you're looking for something new in small R/C, why not try something old?

**Here are the addressesthat are pertinent to this article:*
***Midway Model Co.,** P.O. Box 9, Midway City, CA 92655.*
***Flyline Models, Inc.,** P.O. Box 2136, Fairfax, VA 22031*
***Cleveland Model & Supply,** 10307 Detroit Ave., Cleveland, OH 44102.*
***Cox Hobbies, Inc.,** 1350 W. Rincon St., Corona, CA 91720.*
***Carl Goldberg Models, Inc.,** 4734 W. Chicago Ave., Chicago, IL 60651.*
***Tower Hobbies,** P.O. Box 778, Champaign, IL 61820.*
***Old-Time Plan Service,** P.O. Box 90310, San Jose, CA 95109.*
***Sig Manufacturing Co., Inc.,** 401 S. Front St., Montezuma, IA 50171.* ■



This '37 Cleveland Cloudster was designed for a .15 "sparker." It makes an ideal 1/2A R/C model.

RATE GYROS

(Continued from page 38)

OTHER USES

In addition to rudder control, gyros can also stabilize roll (aileron) and pitch (elevator) control. Light models can be overpowered in any axis by wind, and gyros can help mitigate this. Heavy models are less affected as a consequence of their greater inertia. I've long advocated that, "If you know how to fly heavy, it is to your advantage to do so in scale competition."

I think experience with rate gyros for rudder control will win converts to their use, and that gyros used for other purposes may win acceptance as aids to flight realism. The rate gyro used in this regard is much like shock absorbers on an auto's suspension—not a bad comparison, when you're looking for a realistic ride "appearance" in the air with your scale model.

CONCLUSION

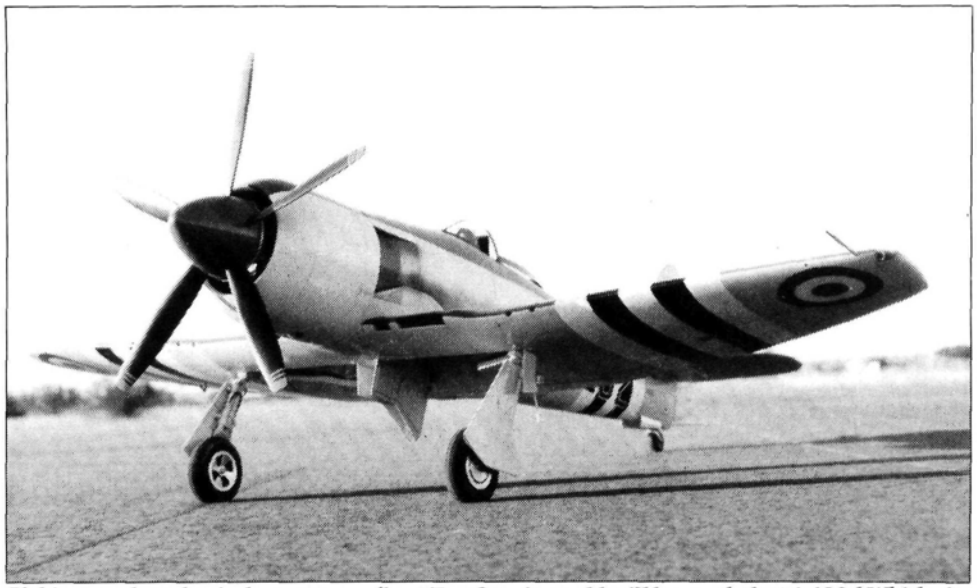
I'm surprised that, until recently, so little has been written on this subject. Competitors may find it a difficult subject to discuss, as it relates to the flight performance by which they're judged. Because of the rapid response time required during takeoff and the accelerated scale-time effect, rate gyros enhance safety and make for more realistic scale flight. Also consider that the persons protected by the use of gyros include you and me! What do you think? Let your district AMA Scale Contest Board Representative know.

**Here are the addresses of the manufacturers of the gyros shown in the photographs:*
Airtronics Inc., *11 Autry, Irvine, CA 92718.*
Miniature Aircraft USA, *2324 N. Orange Blossom Trail, Orlando, FL 32804.*
Futaba Corp. of America, *4 Studebaker, Irvine, CA 92718.* ■

SPORTY SCALE

TECHNIQUES

by FRANK TIANO



If this were the only airplane you saw fly at Top Gun, it would still be worth the trip! Mel Whitley's Sea Fury is a spectacular bird that emits the most realistic sound.

I'LL DEVOTE MOST of this month's column to Top Gun*, but I'll make some announcements before I start. I don't yet know the dates or the location of the much-talked-about Unlimited Race for the 100-inch scale Reno Racers, but I do know of a couple of new designs that would be competitive in this race—if it ever happens.

Bob Campbell's R/C Kits* has a 108-inch F8F Bearcat that can be trimmed easily to 100 inches for the clipped-wing race version. Since the rules allow for some deviation from true scale, Bob's stand-off design should fit right in. His original weighed 35 pounds, and it was powered by a Sachs 5.8. The Unlimited rules allow up to 55 pounds, so there's enough room for a heavier, more powerful engine. The $295 kit includes a foam fuselage, wing, stab and fin cores, a fiberglass cowl, a clear canopy, all-balsa sheeting and full-size plans.

Another suitable 100-inch airplane is the new P-51 designed by Nick Ziroli*, and still another is an 11-percent blowup of Don Smith's* Seafury plan. Don Smith has just released new plans for two very interesting, twin-engine German aircraft. The Henschel 129B is so ugly and sinister that it's almost pretty. It's a simple twin-engine plane that's designed around a couple of Zenoah G-23s.

We'll enter one of these tank busters in Team Scale at Top Gun, because it has a simple landing gear, a non-retracting tail wheel and a conventional flap arrangement. The 1/6-scale model has a 93-inch wingspan, and it's light enough to be powered by two powerful .60s, although larger engines will enhance its single-engine performance.

Don's other offering is an 89-inch ME-110. He shows the popular "C" and "G" versions of this 1/7.2-scale model. Once again, power can be anything from a pair of hot .60s and upwards. Each plan sells for $42 and includes multiple sheets and outlets for canopies and cowls.

Bob Campbell in a serious mood beside his large Grumman Bearcat. At 35 pounds, it needs husky landing gear, such as those made by Robart Mfg. Under the cowl, there's plenty of room for anything up to 9ci.

TOP GUN STUFF

Excitement continues to build as the Top Gun Invitational draws near. The field is now complete, and this year's entries will surpass those of last year. An airplane that was high on the top-ten list in 1989 (Top Gun's first year) might now be in the lower third of that list! I'm told that some pilots are building an airplane specifically for Top Gun and Masters competition.

At this year's event, you'll see unbelievable models, and if all goes well, there will be seven or eight European entrants with World Class models. Our

This is the kind of airplane and the kind of flying that it takes to get invited to Top Gun. Bill Carper plants the Thunderbolt right on the center line!

own Top Guns will compete with some new and unusual stuff. Bob Violett will field his new Aggressor F-16, while his rival and good buddy Bob Fiorenze will show us a new F-18.

If it's jets you like, boy, have I got great news for you! Other jet entrants include none other than Dennis Crooks, Mark Frankel, Mike Kulczyk, Bill Harris, Jerry Ortego, Terry Nitsch, Garland Hamilton and, of course, 1990's "Mr. TG," Ron Gilman!—and if that isn't enough, there may be a couple of surprise jet entries in Team Scale as well.

Also entered are outstanding prop-driven aircraft, whose pilots include Doc Keith, Jeff Foley, Bob Hanft, Ray Torres, Charlie Nelson, Diego Lopez, Steve Sauger, Mel Whitley, Bill Steffes, Cliff Tacie, Rich Uravitch, Bill McCallie, Nick Ziroli, Bob Underwood, Gene Barton, Scott Foster, Bill Carper, Rich Lewis, Charlie Chambers, Shane Cramer and Chuck Fuller.

Top Gun has new 1991 rules that clarify the gray areas in the previous rules and introduce some new concepts. A mediocre pilot or team entry can't survive at Top Gun; to do well, a pilot must have an outstanding airplane and great flying skills.

There are only a few rooms left at the Palm Beach Polo Club, and with that in mind, I'll pass on the names and phone numbers of other motels: Days Inn*, Comfort Inn* and Royal Inn*. To get the special rate, make sure that you mention Top Gun when you call for a reservation. More accommodations are within 25 minutes of the field.

Model Airplane News and Pacer Technology have contributed a lot to Top Gun's success. They've allowed us to inject some worthwhile cash awards into a very classy competition. Many other manufacturers have followed the lead by offering some terrific prizes. *MAN* and Pacer have done so much for the sport of model aviation.

Top Gun attracts lots of local television coverage and magazine reporters from all over the world. Spectators now plan their vacations around this event, and recognizing our numbers, motels, hotels and car-rental companies are starting to offer better rates.

TOP GUN TRAVEL

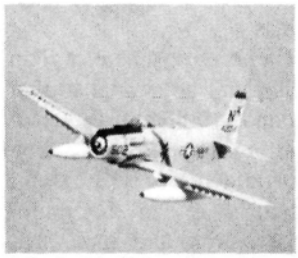
For the first time, we have a major airline helping out. Try to use American Airlines* to travel to Top Gun. Not only will their rates be better, but you'll also help Top Gun receive even more recognition, so that in future years, we can offer you better services. When you call American, you must mention Top Gun and STAR 014FV. If you don't mind making one long-distance call, call Cindy Burkey at Davie Travel*. She promises you first-class service and all the help you need with your airline reservations and rental cars. Don't forget that Florida is absolutely gorgeous in early May, and there are 99 scillion things to do. If Cindy isn't available, just leave your name and number, mention Top Gun, and she promises to get back to you. Yes, she's authorized to book your flight with American Airlines.

The atmosphere at Top Gun will be similar to that found at a Grand Prix racing event. Several hobby manufacturers will exhibit their wares in the trade-show area, and some will perform demonstration flights during the lunch break. Along with some outstanding flight demos by the Bob Violett Team and Yellow Aircraft's Bob Fiorenze, you'll see the Cloud Dancers' very own Don Muddiman throw his Flying Machine around the sky in an unbelievable routine. How about one of the country's finest freestyle aerobatic performers? Yup—none other than Lanier Models' Bubba Snively, who will do some

One thing that makes Top Gun so interesting and competitive is the rule that requires both a fast and a slow flyby. For maximum points, the difference between the two should be very noticeable to the judges. Rick Lewis demonstrates the slow flyby!

things with his Ultimate that you've probably never seen before! Bob Campbell also plans to bring his gigantic B-17 along for static display and a flight demo or two.

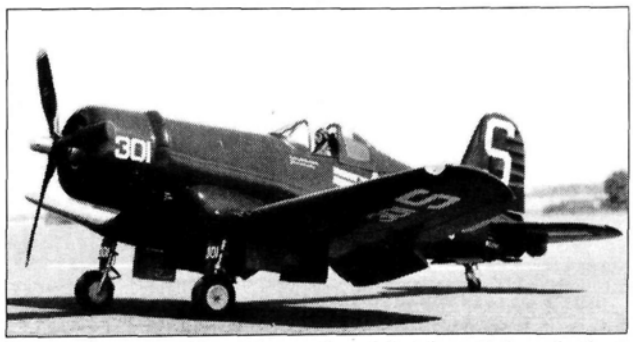
You'll see the pilots, builders and designers of 60 of the finest scale models in the world. You'll meet some famous manufacturers, enjoy a fabulous international food bazaar, and from a spectacular grandstand, you'll watch the country's stiffest competition at what has to be the prettiest, most prestigious flying field in the world!



A fantastic flying shot of Gene Barton's Skyraider banking in for a flyby. Along with Chuck Fuller, Gene has a new sponsor for Top Gun 1991.

Once again, if you need more information, campsite locations, a list of motels or a map, just send me a large, self-addressed, stamped envelope, and I'll get everything out to you right away. Words just cannot describe how excited I am about this year's competition. If you feel the need, be there!

Until next time, have a great winter building season. For me, the flying season is in full swing, although yesterday, it did get a little chilly as the old mercury dropped to 68 degrees! I guess you have to take the bitter with the sweet. Don't forget Top Gun and, for sure, don't forget to check your six.



Do you have trouble with weathered finishes? Take a look at Corvin Miller's Top Gun entry. His Corsair is modeled after one that was restored near his hometown.

**Here are the addresses and telephone numbers that are pertinent to this article:*

***Top Gun/Frank Tiano Enterprises,** 15300 Estancia Lane, W. Palm Beach, FL 33414.*

***Bob Campbell's R/C Kits,** 221 Middlesworth SW, N. Canton, OH 44720.*

***Nick Ziroli,** 29 Edgar Drive, Smithtown, NY 11787.*

***Don Smith Plans,** 2260 N. Dixie Hwy., Boca Raton, FL 33431.*

***Gene Barton Machining,** 11640 Salinez, Garden Grove, CA 92643.*

***Days Inn,** (407) 686-6000.*

***Comfort Inn,** (407) 697-3388.*

***Royal Inn,** (407) 793-3000.*

***American Airlines,** (800) 433-1990.*

***Davie Travel,** (305) 472-7900.* ■

NI - CD TIPS

• **Maximizing Ni-Cd life.** Every Ni-Cd cell has a built-in number of charge/discharge cycles. As a cell is cycled, its capacity slowly decreases. The life of a typical Ni-Cd battery is estimated to be 10 years or 1,000 charge/discharge cycles, but this is only a rule of thumb.

For battery longevity, the key variables are whether you:

1) fast-charge and, if so, also occasionally slow-charge to balance the pack, or

2) tend to run the pack all the way down.

Failure to slow-charge occasionally (and thereby re-balance the pack), or the repeated over-depletion of a Ni-Cd, will shorten its life.

• **How far do you discharge Ni-Cds?** The appropriate cut-off voltage depends on the average discharge rate: **(1)** If the discharge rate is below 500mAh, 1.1 volts should be the cut-off point. **(2)** If the rate is between 500mAh and 1 amp, cut it off at 1 volt. **(3)** If the rate is above 1 amp, cut the discharge at .9 volt per cell (as when running motor packs).

• **What about "memory"?** Some maintain that battery memory is just voltage depression during discharge caused by repeated over-charging. They argue that high-rate

charge and full discharge "wash out" the battery and preclude any memory problem. Car racers report that consistently running a racing pack until it's 80-percent depleted and then peak-charging it results in a battery that won't perform to 100 percent of its theoretical capability when that extra 20 percent of run time is needed. To eliminate this effect, discharge to .9 volt per cell, fast-charge, and repeat the cycle four or five times.

• **Balancing packs.** A pack that has been partially discharged within the previous 24 hours can be peak-charged without harm, because the relative charge of the individual cells won't have drifted significantly. If you suspect your pack is unbalanced:

Slow-charge the pack overnight, and then trickle-charge it for a day or two to balance it finely (trickle-charging is optional). A slow charge is sometimes referred to as the "10-hour rate." A trickle-charge is 1 to 2 percent of the battery's mAh rating. A continuous trickle-charge safely maintains the *existing* charge and keeps it balanced, but it won't recharge depleted cells. —*by the Staff of Model Airplane News.* ■

PRODUCT NEWS

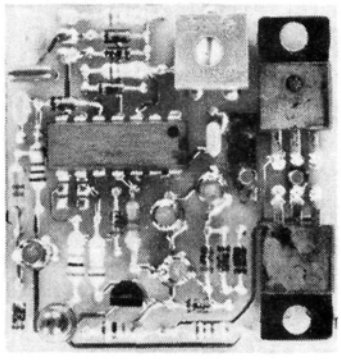
Descriptions of new products appearing in these pages were derived from press releases by the manufacturers and/or their advertising agencies. The information given here does not constitute endorsement by Model Airplane News, or guarantee product performance. When writing to the manufacturer about any product described here, be sure to mention that you read about it in Model Airplane News.

FRENCH TRICKLER Charging Adaptor

Now you can keep your R/C batteries on trickle-charge without a separate trickle- charger! The French Trickler charging adaptor reduces the input voltage that a factory-supplied R/C charger "sees." Just charge the batteries as usual, then power the charger in series with the Trickler. An LED on the Trickler glows while the batteries remain on trickle-charge. The device reduces the charge rate from C/10 to C/50, so you can leave the batteries on charge indefinitely without harm.

Price: $9.95 (plus $2 S&H)

For more information, contact French Electronics, Inc., P.O. Box 255, Worthington, OH 43085.

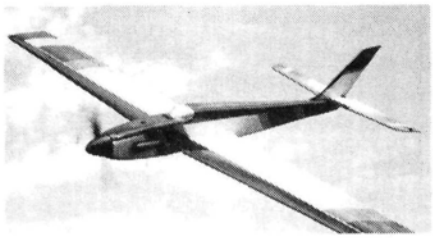


RK ELECTRONICS Glow Switch

The onboard Glow Switch makes it easier and safer to start 2- and 4-stroke engines; just throttle back and flip the prop! There are no external batteries or cords to deal with, because it's powered by an onboard 1.2V Ni-Cd cell. Automatic "turn off" means the unit is shut off when the receiver is powered down. The Glow Switch works with AM, FM and PCM radios, and one or two glow plugs. It has servo-reversing and an adjustable trip point with an LED indicator. This unit provides more reliable idling (especially for 4-strokes), and it's ideal for inverted and cowled engines. Its unique Voltage Tripler and Mosfet design mean that the maximum amount of heat is directed to the glow plug. It comes with tinned leads or an optional Futaba J connector.

Price: $39.95 (add $5 for Futaba J connector)

For more information, contact RK Electronics, 304 Fox Run, Hudson, NH 03051.



DOUGLAS AIRCRAFT MODELS Electric Breeze

Douglas Aircraft Models' first electric release—the Electric Breeze—is a 7-cell, .05 to .075, 52-inch-span plane that's based on Douglas's Silhouette and Quicksilver aerobatic slope-glider kits. The Breeze is designed for intermediate and advanced pilots. It has an SD 6060 airfoil, which enables it to fly fast right-side-up or inverted. Using a good ferrite motor and a good prop, it can do all kinds of aerobatics, including outside loops; using a hot cobalt motor, its performance is amazing! The Breeze can be flown on two channels (aileron/elevator) or four channels (add rudder and speed controller), and it has removable landing gear.

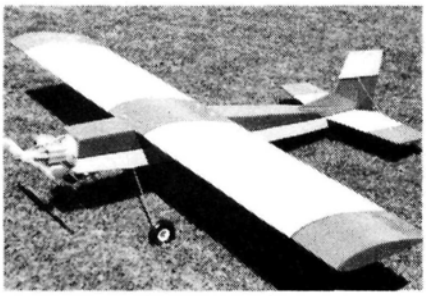
For more information, contact Douglas Aircraft Model Aviation, P.O. Box 92472, Long Beach, CA 90809.

BYRON ORIGINALS Aerobatic Russian Aircraft

Byron Originals' 1/4-scale version of the Sukhoi SU-26M Russian aerobatic monoplane is 72 inches long, has an 82-inch wingspan and weighs (almost-ready-to-fly) 19 to 20 pounds. This fiberglass-fuselage/foam-wing kit features: a plug-in wing design; wing-mounted aileron servos with full-span ailerons; and a long tail moment for smooth transitions from one maneuver to another. The Sukhoi's spins (in either direction) are predictable and, using the proper engine, its vertical penetration is awesome, and three-point landings are a breeze! Suitable engines include: Saito 270 and 300 Twin 4-stroke; O.S. 240 and 300 Twin 4-stroke; Quadra 50S (PurrrPow'r optional); A&M 3.7 and 4.2; Zenoah G62.

Part nos. 6130214 (Sukhoi Kit); 6130136 (Q-50S PurrrPow'r System); 6030359 (custom mount for A&M 3.7 and 4.2); 6030465 (custom mount for G-62 and Q-50S); 6030459 (14-inch engine mount—undrilled).

For more information, contact Byron Originals, Inc., P.O. Box 279, Ida Grove, IA 51445.

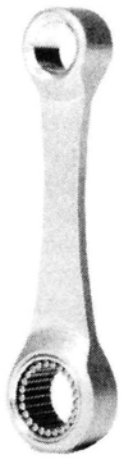


AIR FLAIR
Awe Schtick

The Awe Schtick is a shoulder-wing "stick-type" plane based on Air Flair's Impulse series of planes. It has the same airfoil and nearly the same moments as the Impulse Plus, and it's very aerobatic, yet smooth and predictable with slow flight/stall characteristics. This 84.5-inch-span plane weighs 12 to 14 pounds, and it's set up for use with a variety of engines, including 1.08 to 1.8 2-strokes and 1.2 to 2.4 4-strokes. The Awe Schtick is an excellent "big bird" trainer.

Price: $135 (plus $5 P&H)

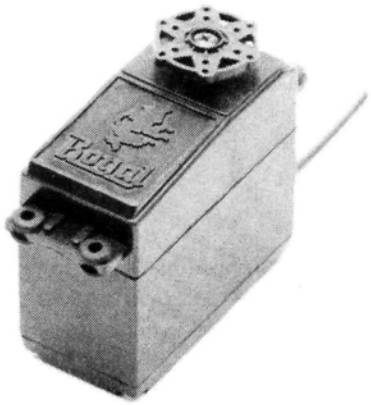
For more information, contact Air Flair, P.O. Box 2075, Fairborn, OH 45324.



KEELEY'S CUSTOM MOTOR WORKS
Titan Rods

Keeley's Custom Motor Works introduces a new line of high-performance connecting rods. Developed for performance-minded airplane, car and boat modelers, Titan Rods are CNC-machined of aircraft-grade titanium alloy and are virtually indestructible, yet light. They feature extremely high-tensile strength and a thin cross-section for lower aerodynamic drag, and they're available with either needle bearings or phosphor-bronze, bushed bottom ends. Titan Rods are guaranteed for one year against bending or breaking, and they're available for: REX 21; OPS 45, 60, 67 and 80; Picco 45, 60, 67 and 80; Hydro 90; Rossi 21, 60, 65, 80 and 90; K&B/KBV 7.5, 67, 72 and 82; O.S. 91.

For more information, contact Keeley's Custom Motor Works, 2677 Credit Valley Rd., Mississauga, Ontario, Canada L5M 4J8; or Speedmaster Model Products, 1325 Carol Dr., Memphis, TN 38116.

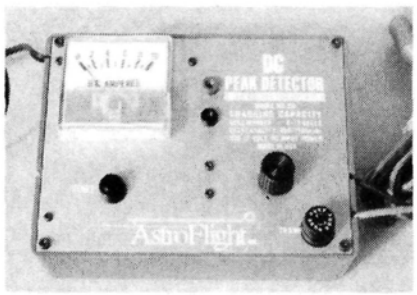


ROYAL PRODUCTS CORP.
Royal Maxi Titan

The 3.7-ounce Royal Maxi Titan servo is perfect for 1/4-scale applications. It features: a top bearing output-shaft support; a cold-molded gear train for more precise movement and less gear play; an isolated pot to minimize pot wear caused by vibration; and a spline shaft, which allows the output arm to be centered externally. Specifications: output torque, 112 ounce/inches; current drain, 8mA; transit time, .22 seconds/60 degrees; Mitsubishi IC chip; Noble pot. Outlets available: rotary wheel, straight long arm, "T-" arm and "X-"arm. Dimensions: 1.14x2.32x1.97 inches (the output wheel is the size of a nickel).

Price: $32.95

For more information, contact Royal Products Corp., 790 W. Tennessee Ave., Denver, CO 80223.



ASTRO FLIGHT
DC Peak Detector

This fully automatic, peak-detector charger works off 12V auto batteries or 12V car battery chargers. Its current charge can be adjusted from 1 to 9 amps, and its built-in electronic voltage booster lets you charge any 4- to 12-cell Ni-Cd pack! Charge 450mA receiver and transmitter packs at 1 amp, 1700mA Sanyo SCE packs at 3 amps and 1400mA Sanyo SCR packs at 9 amps. The DC Peak Detector is perfect for 8-cell Whisper helicopter packs and 12-cell Ni-Cd packs in Cobalt-15-powered planes.

Price: $109.95

Part no. 110A

For more information, contact Astro Flight, Inc., 13311 Beach Ave., Marina Del Rey, CA 90292.

MGA ENTERPRISES
WW II Pilot Bust

This 1/4-scale U.S. Navy pilot bust is completely assembled, painted and ready to fly! The 6-ounce bust is 5 inches high, 5 1/2 inches wide, and its details include: a brown leather helmet and goggles, white parachute straps and a yellow combat flying suit.

Part no. 200B

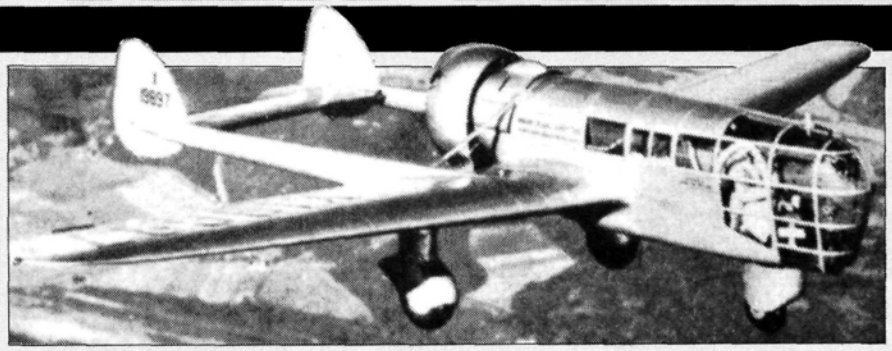
Price: $19.95 (plus $3.25 S&H)

For more information, contact MGA Enterprises, P.O. Box 5631, Fresno, CA 93755.

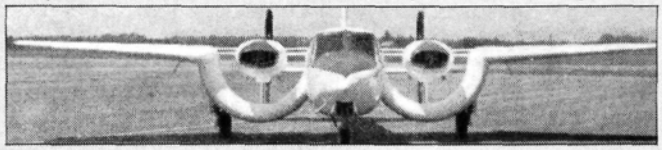
NAME THAT PLANE

CAN YOU IDENTIFY THIS AIRCRAFT?

If so, send your answer to Model Airplane News, **Name that Plane Contest** (state issue in which plane appeared), 251 Danbury Rd., Wilton, CT 06897.



Congratulations to Robert Wynne of Mercer Island, WA, for correctly identifying the Custer Channel Wing CCW-5 that appeared in our February issue. (We received 53 correct entries.) The 1953 CCW-5 was the final version of the channel-wing design to come from the fertile mind of Willard R. Custer. The initial idea was for an aircraft that would be able to rise vertically and hover; have forward flight speeds in excess of current design aircraft; and be able to slow down to a hover and land vertically while under full control. The CCW-5 put on spectacular demonstrations of slow-speed flight and maneuverability. One "production" model was built in 1964, but there were no backers to finance the plant and tooling for additional airframes. It was claimed that the prototype had been flown as slowly as 11mph, had a rate of climb of over 3000 feet per minute and always retained full control. Its wingspan was 41 feet, 2 inches; it was 28 feet, 8½ inches long, 10 feet,10 inches high and weighed 5,400 pounds when loaded. Power came from a variety of Continental engines ranging from two 225hp to two 280hp. ■



The winner will be drawn four weeks following publication from correct answers received (on a postcard delivered by U.S. Mail), and will receive a free one-year subscription to **Model Airplane News.** *If already a subscriber, the winner will receive a free one-year extension of his subscription.*

AIRWAVES

(Continued from page 111)

Pat, thanks for the letter—we like to hear from younger modelers who have joined the hobby and hope that your enthusiasm is contagious! The Telemaster is a great first plane, but you might be biting off a little too much with the Chipmunk as a second plane. We recommend that you get some more flying experience with an intermediate-to-advanced, mid- or low-wing trainer before taking the Chipmunk for a spin. If you build it, please send us a photo for "Pilots' Projects"! TA

We welcome your comments and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News,** 251 Danbury Road, Wilton, CT 06897. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we cannot respond to every one.

CLASSIFIED

Send ad and payment to *Model Airplane News*, 251 Danbury Rd., Wilton, CT 06897. Non-Commercial classified ads (commercial ads of any kind not accepted at this special rate). Rate: 15 words or less, $4.50 payable in advance. No charge for name and address. Additional words, 25¢ each. Commercial classified ads (rate applies to anyone selling on a commercial basis–retailers, manufacturers, etc.) Rate: 50¢ per word, payable in advance. Count all initials, numbers, name, address, city and state, zip and phone number. Closing Date for either type of ad is the 20th of the third preceding month (for example, January 20th for the April issue.) We do not furnish box numbers. If you would like your ad run in more than one issue, multiply amount of payment by number of months that ad is to run. It is not our policy to send sample copies of tear sheets.

WANTED: Model airplane engines and model race cars made before 1950. Jim Clem, 1201 E. 10, P.O. Box 524, Sand Springs, OK 74063; (918) 245-3649.

PLANS ENLARGED, Large Scale Specialists. PC Model Software. Free information. Concept, P.O. Box 669E, Poway, CA 92074-0669; (619) 486-2464.

WANTED: Berkeley and Cleveland kits or related items: parts, plans, boxes, brochures, books, ads, radio equipment, accessories, etc. Gordon Blume, 4649-191st Ave. S.E., Issaquah, WA 98027.

GIANT SCALE PLANS by Hostetler. We fly what we draw. Send SASE to Wendell Hostetler's Plans, 1041 B Heatherwood, Orrville, OH 44667.

ANTIQUE IGNITION AND GLOW PARTS CATALOGUE: 100 pgs., timers, needle valves, original cylinder heads, point sets, drive washers, stacks, spark plugs, plans. Engines: Atwoods, Baby Cyclones, McCoys, Hornets, others. $8 postpaid U.S., Foreign $20. Chris Rossbach, R.D. 1 Queensboro Manor, Box 390, Gloversville, NY 12078.

R/C WORLD—ORLANDO, FL, CONDO RENTALS—2 bedroom-furnished. Available weekly or monthly. Low rates. 100 acre flying field with enclosed hangar. Swimming pool, tennis courts on site. Minutes from Disney World and Epcot Center. For information call Sharon, (800) 243-6685 or write to Air Age Inc., Condo Dept., 251 Danbury Rd., Wilton, CT 06897.

SCALE MODEL RESEARCH Aircraft Documentation. World's largest. Over 3,000 different Foto-Paaks and 10,000+ drawings. Catalogue $4. 2334 Ticonderoga, Costa Mesa, CA 92626 (714) 979-8058.

WANTED: Old unbuilt plastic model kits. Planes, military, figures, cars, promos. Aircraft or missile desk models. Send list, price. Models, Box 863, Wyandotte, MI 48192.

INTERNATIONAL AIRCRAFT RESEARCH—Need documentation? Include name of aircraft for availability of documentation with $3 for 3-view and photo catalogue. 1447 Helm Crt., Mississauga, Ontario, Canada L5J 3G3.

HELICOPTER SCHOOL: 5 days of hands-on instruction with X-Cell Helicopters and Futaba computer radios. Small classes, tailored to your individual needs. Beginner to expert. Includes all meals and lodging. Over 80 satisfied students and 2,600 flights logged in our first 8 months of operation. Located on a 67-acre airport used exclusively for R/C training. Owned and operated by Ernie Huber, five-time National Helicopter Champion and helicopter designer. Winter and spring classes run January 7 through June 21. Write for free information and class schedule *now* to R/C Flight Training Center, P.O. Box 727, Crescent City, FL 32112-0727, or call (904) 698-4275.

USED ENGINES WANTED—Ignition, glow, diesel. Send description and price for prompt reply. T.Crouss, 100 Smyrna St., West Springfield, MA 01089.

WANTED: old proportional R/C systems; special interest in SPAR, C&S DIGICON, DEANS, INTERGRATED DESIGN, GALAXY, QUADRUPLEX MARK II and others. Ron Gwara, 21 Circle Dr., Waverly, NY 14892. (607) 565-7486.

ENGINES: Ignition, glow, diesel. New, used, collectors, runners. Sell, trade, buy. Send SASE for list to Rob Eierman, 504 Las Posas, Ridgecrest, CA 93555. (619) 375-5537.

ELECTRIC FLIGHT EQUIPMENT: *We cater to the electric flier!* The best and largest electric flight supply in the Northeast, specializing in *Astro Flight* equipment. Kits, motors, batteries and lightweight building supplies, plus everything else you need for electric flight. For a catalogue, send $4 (in the U.S.; $5, foreign) to CS FLIGHT SYSTEMS, 31 PERRY ST., MIDDLEBORO, MA 02346, or call (508) 947-2805 to order. Visa, Mastercard.

COMPUTERIZED AIRCRAFT PLOTS: Technical illustrations suitable for framing. Three-views. Computer scale drafting and scanning services. Turn old prints into masterpieces! Catalogue, $1. D-TECH SYSTEMS, Rte. 2, Box 191-14, Carterville, IL 62918

GIANT-SCALE FLY-IN VIDEO—$19.95 plus $3.50 shipping. Airplane Video, P.O. Box 8577, Norfolk, VA 23503. (804) 480-1553.

BERKELEY, CLEVELAND, ETC., replica kits, duration rockets for jet models. Send two stamps to: WILLAIRCO, 2711 Piedmont Rd. NE, Atlanta, GA 30305.

WARBIRD VIDEOS: Over 100, low as $12. Free brochure. Videos, 54533 Terrace Ln. 152, South Bend, IN 46635.

HARDWARE, SOCKET-HEAD CAP SCREWS @ excellent prices. Example: alloy socket-head cap screws 4-40x1/2, $4.15/100; or stainless, $5.95/100. For free catalogue, write to Micro Fastners, 110 Hillcrest Rd., Flemington, NJ; or telephone (908) 806-4050.

WANTED: Model engines and race cars before 1950. Don Blackburn, P.O. Box 15143, Amarillo, TX 79105, (806) 622-1657

PRECISION SCALE WHEELS & TIRES. Custom-designed aluminum wheels, solid-rubber tires. Each set is not only the scale size for your individual aircraft, but it's as scale as possible in every respect. Custom orders are accepted for any aircraft. F-100D 1/10-scale semi-kit now available. It includes fiberglass fuselage, intake, thrust tube and engine caps. All foam-core surfaces are included with clear canopy and full-size plans and instructions. *Special intro offer, $189.* For more details call or write Glennis Aircraft, 5528, Aroboga Rd., Linda, CA 95901; tel.: (800) 688-3957 or (916) 742-3957.

FOR SALE: Forester "29" ignition engine; McCoy "29" Redhead; a *new* Queen Bee .074. $235. Vander Veer Campbell, 36 S. Mulberry St., Hagerstown, MD 21740.

AERO CLUB OF ISRAEL needs your support for student modelers. SASE for information newsletter. Friends of Aero Club of Israel, 79-02A, 212 St., Bayside, NY 11364.

PRO-IKAR spark-ignition engine, 6.3cc precision-machined, never run, price: $125. Phone (203) 569-0487. Carl E. Bloom, 120 Smart Ct., E. Hartford, CT 06118.

MAGAZINES—British, 147 *Aeromodeller* ('45 to '71), $125; 133 *RCM&E* ('60 to '71), $125; 70 others, $50. PLANS—126 Scale RC & FF to 108-inch, $125. Six-binder set of 204 *Profile Publications*, $125. All, plus extras, $600. Stamp for *list* to Walter Dean, 2334 Whittier Pl., Fairfield, CA 94533.

FOR SALE: Cessna 177 electric-powered airplane complete, ready-to-fly with Futaba 4-channel radio and lots of extra parts. Also included is an AC/DC auto charger, ten brand-new props, spare battery pack, spare .05 electric motors, spare landing gear with wheels and optional gear-drive system for motor. Asking $125 for everything. Price also includes shipping. (Plane has a 47-inch wingspan.) Frank Voci, 50 Woodvale Loop, Staten Island, NY 10309; tel.: (718) 984-5971.

WANTED: MIDWEST A-4: any condition (even wrecked!). Also, any other ducted-fan planes, kits, plans, accessories, or wrecks. Please call with details. Chris, (918) 663-7847 or 734-0637.

OLD-TIMERS, take a ride back in time to airplane modeling roots with this vintage book—*Gas Models*. A true collector's book from the early editors of *Model Airplane News*, it contains the best of modeling from the '30s and '40s, including great technical information and classic construction articles from the Golden Age period. $7.95, add $2.95 S&H for first item; $1 for each additional item. *Foreign:* (including Canada and Mexico)—*surface mail,* add $4 for first item, $2 for each additional item; *airmail,* add $7 for first item, $2.50 for each additional item. Payment must be in U.S. funds drawn on a U.S. bank, or by international money order. Connecticut residents add 8% tax. Air Age Mail-Order Service, 251 Danbury Rd., Wilton, CT 06897.

CASH OR TRADE for your old clunker ignition engines and twins. Plans: 1/4-scale Piper Tri-Pacer, Aeronca "K," Puss Moth, Leopard Moth–all four sets, $100. Send large SASE for latest. Carl V. Miller, 130 Yucca Dr., Sedona, AZ 86336.

MODEL AIRPLANE NEWS

HOBBY SHOP DIRECTORY

Retailers: Make your business grow with new traffic! Now you can advertise your hobby shop in the **Model Airplane News Hobby Shop Directory**. The listing will be published monthly and will be listed according to city and state. You will have 3 to 4 lines, approximately 20 words, in which to deliver your sales message, plus space for your store's name, address, and telephone number.

HOBBY SHOPS: Act now and get first ad free!
Directory space is sold on a yearly basis with a choice of three payment plans: 1. $179 per year, payable in advance; 2. $97 for six months, payable in advance; or 3. $17.50 per month to be billed monthly. Space reservations must be received by the 20th of the third month preceding publication (for example, January 15th for the April issue).

ALABAMA—Huntsville
4.5 miles east of the Alabama Space and Rocket Center. Complete line of Radio-Control, Free-Flight, and Control-Line Airplanes and Hardware, HO&N Scale Trains, Rockets, Ships, and Plastics. Hours: Mon-Fri, 9-6; Sat, 8-5; Sun, 12-5. Daily UPS pickup.
WILSON'S HOBBY SHOP
117 Governors Dr. **(205) 539-2259**

CALIFORNIA—Torrance/Gardenia
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CLUB OF THE MONTH

FLYING KNIGHTS OF HAMBURG, NY

c/o Robert Blickwedehl, 9 Fir Top Dr.
Orchard Park, NY 14127

Club newsletters can be sparse in winter—it's cold and snowy and nobody's flying, right? So what is there to report? Lots! The "Knight Flyer," the newsletter of the Flying Knights of Hamburg (near Buffalo, NY) is full of building tips and plans for upcoming activities.

The Flying Knights don't slow down in the "off season." At the Hamburg Snow Fest in January, they raffled off R/C equipment, ran an exhibit and even did an R/C car demo on ice! In February, they had a display at the Hamburg trade fair. Between events, they were busy building; members' recent projects include an F-6 Hellcat, a 1/4-scale Clipped Wing Cub, a P-40 Warhawk—even a 1929 Heath Parasol scratch-built out of cardboard!

The Flying Knights have plenty of spring plans, too, such as starting work on a second runway at their property at North Collins field and unclogging the new drain tiles. Members are already forming a WW II interest group that will develop theme materials for the Scale Rally—and that's not till August!

Most of the newsletter is taken up with modeling tips. Reprints from other clubs tell how to mount wheel pants and make strong glue joints—even how to build skis of aluminum strap for winter flying. All you need are mounting blocks, 6-32 setscrews and some music wire (to keep the skis level and to act as a shock absorber for pitch control).

Members share their ideas, e.g., those on making a priming safety light, scaling up dimensions using rubber bands (this works well for marking template stations when you cut tapered foam wings) and making print wood (transfer a photocopy of a pattern onto the wood by pressing with a hot iron).

There's more information on sanding blocks and a section entitled "All You Ever Wanted to Know about Balsa but Were Afraid to Ask"! Did you know that the best grades come from trees felled between the sixth and eleventh years (because they're less susceptible to rot and fungus)? Do you know your A and B grains from the C? The Flying Knights do, thanks to their last newsletter!

Congratulations, Flying Knights, for being our "Club of the Month." We're sending you two free subscriptions to *Model Airplane News,* and we hope you'll find more great modeling tips and project ideas in its pages. ■

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